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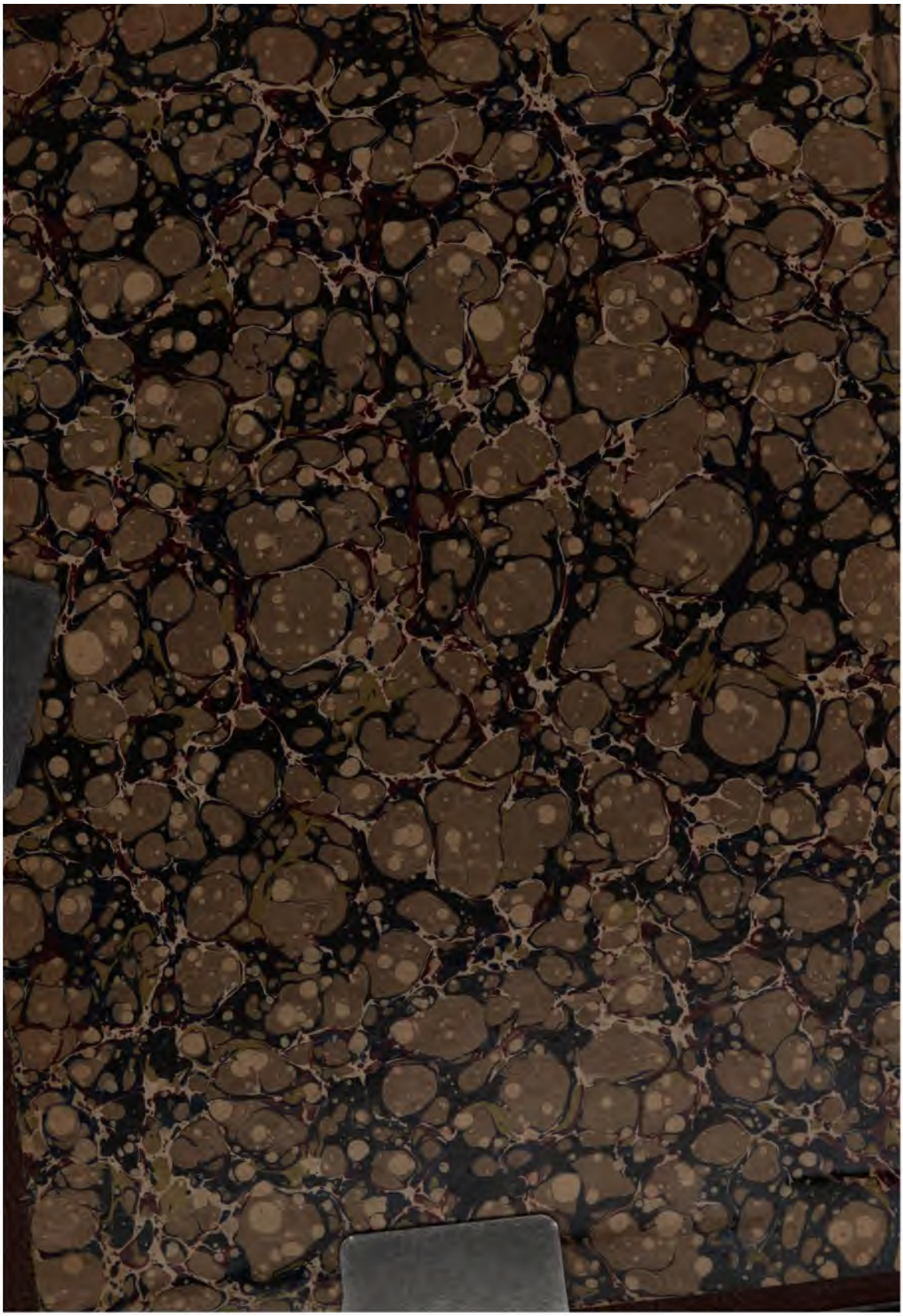
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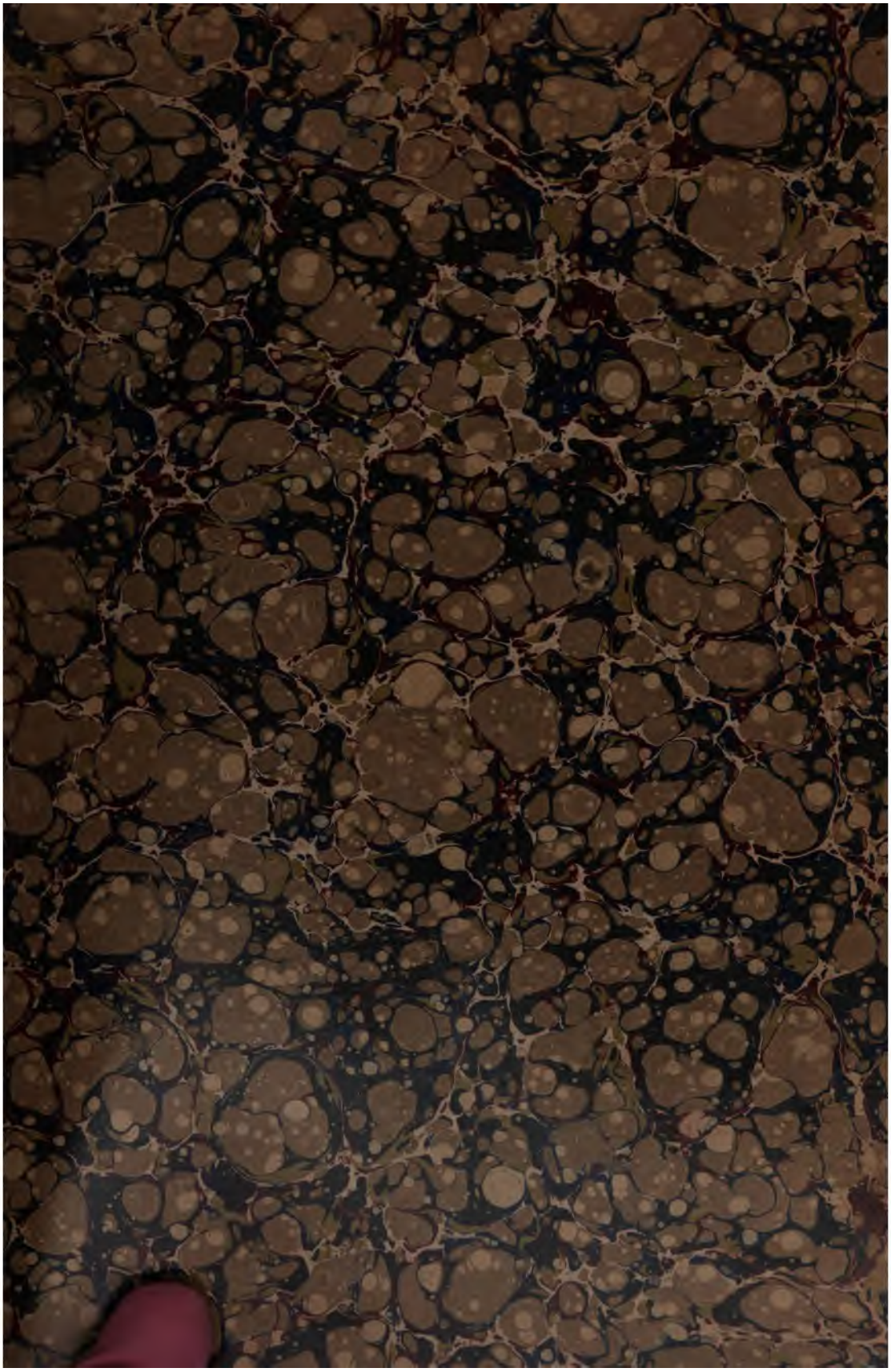
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PSYCHE

THE SWARMING OF *ANOPHELES PUNCTIPENNIS* SAY.

BY FREDERICK KNAB, WASHINGTON, D. C.

UPON October 7 and 14 the writer observed the mating habits of *Anopheles punctipennis* and as, up to the present, nothing appears to have been made known regarding the mating habits in the genus *Anopheles*, the following notes are offered. Much to his surprise the writer found that the males of *Anopheles* swarm as do those of *Culex*, although the behavior in the two forms is quite different.

The observations were made on Plummers Island (Maryland) in the Potomac River, about ten miles above Washington. Near the highest part of the island is a ledge of rock forming an open space surrounded by the woods on three sides. The side towards the river is open, save for a couple of small trees at the edge, and terminates in a nearly perpendicular cliff. On October 7, shortly before 5 o'clock, the writer visited the spot to enjoy the sun-set. The ledge is about sixty feet above the water and on its highest part, where some tufts of tall grass grow in a crevice of the rock, was a swarm of dancing Diptera. The swarm was directly over the tufts of grass, its base seven or eight feet from the ground, the apex five or six feet higher. Although in appearance and action quite unlike *Culex pipiens* (observed on previous occasions) they were recognized as mosquitoes by the prominent palpi and the plumed antennae. With a sweep of the net fifteen were secured and proved to be males of *Anopheles punctipennis*. Their appearance in flight differed from *pipiens* mainly by the position of the legs which were held straight behind and close together. The palpi and antennae, directed straight forward, also appeared much more prominent than in *pipiens*, which, together with the much longer legs, extending out behind, gave them a very characteristic appearance.

In their actions, too, they differed markedly from *pipiens*. The swarm was small, composed of less than a hundred individuals, and was not as compact as the swarms of *pipiens*. The movements of these males were far more free and varied than those of *pipiens* which constantly repeat the same circumscribed movements. The *Anopheles* flew about in the swarm in a circling upward or downward "corkscrew" course. Their movements were more rapid than those of *pipiens* and often

irregular; single individuals would at times leave the swarm, and cutting a wide circle, return into it. Sometimes these stray individuals would fly for a short distance with a peculiar rapid zigzag motion — a series of short sidewise jerks — and then return with the ordinary steady flight. In spite of these varied evolutions the mosquitoes showed a tendency to face in one direction, presumably towards the wind, although the evening was perfectly calm and there was no breeze apparent. As it began to darken the males began to leave the swarm one by one, flying upward, either into surrounding trees or more often they would disappear into the sky. On this evening copulation was not observed and from the following observations it may be assumed that union only takes place during the early part of the swarming.

Although stormy and cold weather intervened, the following Sunday proved fine and the ledge on the island was again visited. Shortly before 5 o'clock, with the sun still shining but near the horizon, a few males were found already assembled and engaged in their circling flight above the grass-tufts. Others came from different directions and joined the swarm and by sunset it consisted of perhaps sixty or seventy mosquitoes. It was difficult to follow the movements of single mosquitoes but it seemed that in circling about they described a figure-of-eight — sometimes on a plane, or ascending and descending. At 5.15 a pair was seen falling out of the middle of the swarm, grappling each other as they fell. They had not dropped far below the swarm when union was affected, and, swinging out in opposite directions, still united they drifted slowly away towards the ground. Within ten minutes six pairs were seen to drop out of the swarm and copulate in this manner but after that no more. Three of the pairs were captured in the net; one pair rested in the bottom of the net about a minute, then separated and flew out; the other two pairs remained united even after death in the killing-bottle. It could not be determined if in the slow flight of the united pair the female leads off as is the case with *pipiens*, but it is to be presumed so, as she is the larger. Neither could it be positively ascertained whether any females formed part of the swarm. None were seen to enter at the time copulation took place, but with the rapid and confused movements of the members of the swarm (some flying out of the swarm and back again, as described above) it was impossible to keep all the individuals under close observation. However it is safe to conclude that, as in *pipiens*, the swarm proper consists wholly of males — certainly the fifteen specimens captured out of the swarm on Oct. 7 were all males. If there is any choice made in the selection of a mate it must be on the part of the female, for there appears to be no effort made, or any struggle, on the part of the males to secure the female entering the swarm.

An interesting fact was the prompt reaction of the entire swarm to sound. The

sound of the voice in conversation would, at the first shock, precipitate the entire swarm about a foot, and the mosquitoes would continue in rapid and confused movement while the speaking continued. This effect could be noticed even when one spoke in quite a low voice, and a pistol-shot, perhaps half a mile off, precipitated the swarm in the same manner. When silence was restored the swarm immediately resumed its normal flight. The experiment was repeated many times and each time the effect was instantaneous.

At about 5.30 the swarm began to diminish, the males flying off singly into the air. Very often a male would start off with a hesitating flight, and after flying some distance and hovering about as if reluctant to leave, would again return into the swarm. At last the swarm was reduced to three males which remained for some time, and at the last a single male remained, continuing his evolutions alone for fully three minutes, when, at 5.45, he too flew off.

A curious circumstance was the presence, on both occasions, of a swarm of minute Chironomidae in close proximity to the swarm of *Anopheles*. Mr. D. W. Coquillett kindly determined these as *Ablabesmyia pilosella* Loew. While these did not mingle with the swarm of *Anopheles* they were as close as they could be without interference. Apparently the spot which the *Anopheles* had fixed upon had the same attraction for them. This swarm seemed likewise to be composed wholly of males.

It seems remarkable that the attitude taken by *Anopheles* in copulation, end to end and facing in opposite directions, is identical with that of *Culex pipiens*. This remarkable agreement is significant when the structure of the tarsal claws is considered. In both forms it is pratically the same and all the claws of the female are simple. In both cases the legs are not made use of in the copulatory act itself but only in the preliminary scuffle. Dr. H. G. Dyar has found that *Culiseta consobrinus*, another form with simple claws and quite a distinct generic type, takes the same position in copulation. It is fair to assume that this is the mode of copulation in all the forms in which the female has simple claws. On the other hand it appears that in those forms in which the female has toothed claws the position in copulation is face to face, the pair clasping each other. The writer can confirm Goeldi's observation that *Stegomyia calopus* copulates in this manner. Dr. Dyar has observed the same method of copulation in *Aëdes varipalpus* Coq. One cannot avoid the inference that the difference in the structure of the claws is closely correlated with the mode of copulation. It would appear then that the structure of the claws is a purely adaptive one and therefore it cannot be considered of the deep classificatory significance attributed to it by Mr. Coquillett (Science, n. s., XXIII, p. 312,

1906). The correspondence of *Anopheles* and *Culex* (in the restricted sense) in claw structure does not indicate a closer relationship between these genera than with such forms as *Aëdes*. Nor does the marked difference in the claw structure of *Janthinosoma* and *Feltidia* disprove the close relationship of these forms indicated by their so closely similar larva and male genitalia. While the presence or absence of teeth on the claws may be used with advantage in the definition of minor groups, if used as a primary character it would result in quite arbitrary combinations. Indeed there is reason to doubt if it should be considered of even generic value.

Since the publication of my article on the swarming of *Culex pipiens* the following additional references to the copulation and swarming of Culicidae or Chironomidae have come to my notice.

1812. FLOERKE, H. G. (editor) Rauchende aber nicht brennende Thuerme. Repertorium des Neuesten u. Wissenswürdigsten aus d. gesammten Naturkunde, v. 4, p. 179–180.

1830. Anonymous. Insect Transformations. (London) p. 363–365.

1838. LACORDAIRE. Introduction á L' Entomologie, v. 2, p. 374–375, 492.

1851. "ACHETA DOMESTICA, M. E. S." Episodes of Insect Life, v. 1, p. 58–61.

1860. HAGENOW, FR. v., Nachlese über Mückenschwärme. Archiv d. Ver. d. Freunde d. Naturgesch. in Meklenburg, 14 Jahr, p. 457–458.

1865. COWAN, FRANK. Curious facts in the history of insects, p. 278–280.

1871. WEYENBERGH, H. Nog een paar waarnemingen van vliegenzwermen, benevens een overzicht van alle tot heden waargenomen vliegenzwermen. Tijdschrift voor Entomologie, v. 14, p. 221–231.

1891. LYNCH ARRIBÁLZAGA, Felix. Dipterologia Argentina. Revista del Museo de La Plata, v. 1, p. 364–365 (swarming of Culicidae); v. 2, p. 161 (note on the copulation of *Stegomyia calopus*).

1900. GRASSI, BATTISTA. Studi di uno zoologo sulla malaria. Reale Accademia dei Lincei (anno 246), p. 84.

1903. GRAY, ST. GEORGE. Theobald's Monogr. Culic., v. 3, p. 143 (copulation of *Stegomyia calopus*).

1905. EYSELL, A. Sind die "Culiciden" eine Familie. Archiv Schiffs-u Tropen Hyg., v. 9, p. 51–52.

WRIGHT'S NOTES ON BUTTERFLY BIOLOGY.

BY VERNON L. KELLOGG, STANFORD UNIVERSITY, CALIFORNIA.

Mr. W. G. Wright's excellent handbook [1] of the butterflies of the West Coast of the United States is going to help all of us out here who are already interested in insects, and is going to inspire some others with this interest. The writer of the book is a veteran collector and observer, his years of entomological work in California already numbering twenty-five. His records of observation seem quite exact, and undoubtedly all that he has to say in this book, as far as it is based on personal observation, can be relied on. Therefore we may welcome with particular pleasure an interesting introduction — the major part of the book being composed of an annotated catalogue of the butterfly species found in the Western States and of a complete series of excellent colored plates illustrating nearly all of these species — which introduction, called "General Features of Butterfly Life," is made up of some forty or more numbered sections, each with a special title, and all together including some merely curious, but many really valuable suggestive remarks, records of observations, odd conclusions, etc., about butterfly biology.

As many of these notes ought to find their way to all students of insect bionomics, whether they be especially interested in Western butterflies or not, I have extracted, for PSYCHE'S readers, from these "general features" notes of Mr. Wright certain ones which seem to me particularly interesting or suggestive.

As the butterflies are, of all insects, those which we know best systematically and faunistically and also as regards their seasonal changes, their life history, in fact, their general biology, they are, like the North American birds, specially valuable for the student of species-forming, of the effects of isolation and environment, and, indeed, in general, of evolution.

I shall take up Mr. Wright's notes according to his own section numbers.

Section 2. Altitude is equivalent to latitude in its effect on ornamentation. A species which occupies both valleys and mountain heights will be found to be darker in color in those examples from the mountains than those living in the lower valleys. Example, *Meganostoma eurydice*, in valleys, becomes *M. e. bernardino* in its upper range.

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[1] *The Butterflies of the West Coast of the United States*, by W. G. Wright. Whitaker and Ray Co., San Francisco, 1905. Most of the sheets of this book were destroyed in the disaster of April 18 and following days, but a few copies in the hands of the author are for sale.

Section 5. *Range of butterflies.* An interesting brief discussion of the range limits of species and of what determines these limits. Food plant sometimes is the determining factor, sometimes obviously not; something not obvious in many cases, but real.

Section 12. *Seasonal forms.* In some cases the early spring appearers are darker in markings than the later ones; in other cases, as *Colias eurytheme*, the early or cold weather forms are paler than the later warm weather forms.

Section 13. *Hybrids.* Some interesting examples of butterfly hybridization are noted. Author has seen *Thecla dumetorum* and *Th. iroides* in copulo; also *Pieris rapae* plus *P. protodice.* Author noted both of these cases in seven years; in the same time he noted perhaps twenty other pairs of butterflies in regular mating; he concludes, therefore, that one pair of butterflies in every one hundred and forty is regularly mismated, that is seven out of one thousand. "Now if that per cent be normal and continues, we see at once that there can be no resulting fertile progeny from the mismating, for if there were intergraded varieties following every mismating the world would be full of hit-and-miss butterflies in a few years. It therefore appears conclusive that, as in other lines of the animal kingdom, the mismatings must be infertile immediately or in the next generation." [This is in opposition to Luther Burbank's belief that much of the variety in organisms, plants, at least, is due to fertile hybridizing. V. L. K.]

Section 14. *Dimorphism.* An interesting paragraph calling attention to white and black dichromatism of Argynnis and Colias. Author notes that the normal female of Colias is being replaced by the albino, and believes that the normal females of Argynnis nokomis, A. nitocris, and A. leto have all been supplanted by the black form. [This is in line with Emery's theory of the origin of secondary sexual forms — V. L. K.]

Section 16. An interesting paragraph on gynandromorphy. Author notes the capture of a specimen of Lycena piasus with male and female right and left wings (figured).

Section 17. *Sex-marks.* Notes an interesting secondary sexual character namely, in Nymphalidae the fore-legs or lappets of males "are fully clad with plenty of long hairs, while the lappets of the females are less fully clad in shorter and scanty hairs.

Section 20. *Non-feeding species.* Notes the non-feeding characteristic of the Satyridae; yet they have sucking proboscis.

Section 24. *Taming butterflies.* "Butterflies are easily tamed ....; a day or two will suffice to tame a butterfly so that when it sees you coming it will walk toward

you, waving its wings in pleasure at your appearance, and gently unrolling its tongue as it walks along in anticipation of a sip of sweetened water; then it will climb upon you finger.... You must always approach the butterfly with gentle motions, with an absence of anything new or strange, or unexpected or unpleasant, when it is hungry and with food on your finger tips; and when you call it you must each time do so with the same motions and the same tone of voice. The females are more tractable and teachable than the males."

Section 25. *Length of a butterfly's life.* Notes on the duration of the imaginal stage in various butterfly groups; Graptas, Vanessas, Pyrameis (long-lived) Argynnis and Melitaea (a few weeks to two months), Satyridae (short-lived a week or so), and Chionobas iduna (ten days).

Section 27. *Rubbing the wings.* Author notes the curious habit of the Theclas and Lycaenas of rubbing the wings together while at rest. Author sees no explanation. [They are not improbably producing sound by rubbing special series of stiff upright scales together; I have referred to this phenomenon in an early paper on the scales of the Lepidoptera. V. L. K.]

Section 30. *Mimicry or simulation.* An interesting but rather peculiar section under this subject, including some excellent observations, but showing a curious lack of understanding, of the theory of protective resemblance and mimicry on the author's part. The author assumes that mimicry, where existent, is a *voluntarily* acquired condition of the mimicking or simulating species! Among the author's observations are the following: Most Satyridae alight "upon places concolorous with themselves." Chionobas gigas alights only on bare gray rock upon which gray moss and lichens grow. "When it alights on such a place you cannot distinguish it although you saw it alight only three yards away."...."During 25 years' butterfly work I have seen but one attempt of a bird to catch a butterfly; then it was a flycatcher bird chasing a Colias, dashing after it many times until, tired out, it stopped and the Colias escaped."

Section 31. *Movement of butterflies.* By this title author means "the substitution of the abnormal female for the normal; the temporary or permanent disappearance of an entire species, and the unaccountable appearance of lost or unknown species; in fine, the change from one state of things to another state." Author notes the conditions of occurrence of pale females of Colias, the disappearance of the species Lycaena tequa in Southern California, the disappearance and reappearance of Lycaena xerxes near San Francisco, the becoming common of the former very rare Pampila melane, and the disappearance of Chionobas nevadensis, Satyrus wheeleri and Mechanitis californica.

Section 25. *Getting butterfly eggs for rearing.* Under this practical title author has some interesting biological notes on the egg-laying of butterflies. Parnassius, Argynnis, Euptoieta Neonympha, and all genera of Satyridae "will lay their eggs upon anything, even on the net itself if other matters, as proper shade, warmth, air and quiet, are agreeable." All other butterflies demand their own peculiar larval food plant, "and it is necessary that the plant should be fresh and bright, as the butterfly will not oviposit on a plant that is at all wilted."

Section 37. *Breeding in darkness and in cold.* "When caterpillars are bred or raised in darkness from egg to imago, the resulting imago will be darker in color than the normal; the dark spots or lines will be broader and more dense or dusky and the lighter ones will be sordid or dusky. But no excessive variation or deviation from the plan of the normal form has ever been noticed, for the effort has many and many times been made to create new forms by this method." So also by cold. Caterpillars raised in an ice house or in cold storage where the temperature is kept down as low as possible will never develop any radical variation, but the butterflies will be darker than they would have been if raised in a normal temperature.

Section 38. *Migration of butterflies.* Describes large swarms or flights of Pyrameis cardui, not always in the same direction, but generally to the northward. Some came from Baja California and reached British Columbia!

Large Butterfly Captured by Crab-spider.— On the 13th of August, 1905, a swallow tail butterfly (*Papilio troilus* L.) was found lying dead by the side of the Amboy Road at Tottenville, Staten Island. Clinging to the body of the butterfly under one of its wings, was a small whitish crab-spider 7 mm. long, such as is often found on flowers awaiting its insect prey. Evidently the large butterfly had been attacked by the small spider, and had flown away with it, only to die later by the side of the road. There were no flowers near and the butterfly must necessarily have flown some distance before being overcome.

The spider has been shown to Mr. J. H. Emerton, who says it is *Misumena aleatoria*; a species commonly found on the blossoms of wild carrot and thoroughwort where it sits between the flowers and catches butterflies and other insects that alight on them. He adds: — "A butterfly a little too large might easily carry a spider away as yours appears to have done."— Wm. T. Davis.

A NEW GENUS AND SPECIES OF THE FAMILY TACHINIDAE, PARASITIC ON *ARCHIPS CERASIVORANA*.

BY CHARLES W. JOHNSON, BOSTON, MASS.

DICHAETONEURA n. gen.

THIS genus is closely related to *Phytomyptera* Róndani (Nouvi Annali delle Scienze Naturali di Bologna, 1845, p. 13, Tav. 1, figs. 1, 2). Róndani's figure shows the costal setæ only to the tip of the auxiliary vein, in this genus they are equally prominent to the tip of the first, and nearly as marked to the tip of the second longitudinal vein, one or two more conspicuous setæ are present before the junction of the auxiliary vein. *The first longitudinal vein is armed with a large bristle towards the outer end, while the third has two, on the noticeably thickened portion at the base.* In other respects it seems to resemble *Phytomyptera, i. e.*— in having the broad third antennal joint, and in the absence of the apical and posterior transverse veins. The marginal macrochaetae on the second and third abdominal segments are small, there are also discal macrochaetae on the third segment. The latter are sometimes present in *Phytomyptera* according to Braner and Bergenstamm, (Zweiflügler der Kaiserlichen museums zu Wien, Pt. III, pp. 148, 150, 1893.). Macrochaetae on the fourth segment large and numerous.

DICHAETONEURA LEUCOPTERA n. sp.

♀ Head broad, face, front and occiput bluish-gray pollinose, frontal stripe reddish brown, forked above and narrowly extending along the ocellar triangle, upper angle of the cheeks also reddish brown, facial depression deep, and ridge prominent; vibrissae large with numerous smaller bristles above and on the cheeks, frontal bristles descend to nearly opposite the second antennal joint, there are two pair of orbital bristles, and the ocellar bristles are directed forward; first and second joints of the antennae, brown, very short, the second setose, the third black, broad and obtusely truncate, arista black, palpi brown.

Thorax including the pleurae and scutellum bluish gray pollinose, with two short, black, anterior, dorsal lines, and four postsutural and four sternopleural macrochaetae; scutellum bearing four pairs of marginal macrochaetae, two smaller bristles

are also present on the disc of the scutellum. Abdomen broad, entirely black, somewhat shining and covered with fine setae. Legs black, with prominent rows of bristles. Wings broad with a whitish or milky tinge, costa and first longitudinal vein dark brown, the other veins yellowish. Squamae white. Length, 5 mm.

Five specimens of this species were obtained from Dr. F. W. Russell of Winchendon, Mass., who bred them from the pupa of *Archips cerasivorana* Fitch. Later I received a specimen from Mr. E. F. Hitchings of Waterville, Me., who bred it from the same moth, July 28, 1906. Mr. D. W. Coquillett informs me that the National Museum has also received a specimen from Mr. Hitchings. Type in the collection of the Boston Society of Natural History.

In connection with this I should also like to record the host of *Actia pilipennis* Fallen, which was bred from *Schizura concinna* S. & A., August 13, 1905, by Prof. John Barlow, of Kingston, R. I.

ENTOMOLOGICAL SOCIETY OF AMERICA.—The initial meeting was held in the American Museum of Natural History at New York City, Dec. 28, 1906. Prof. Wm. M. Wheeler delivered before the society an illustrated lecture on "The Polymorphism of Insects." Immediately after the lecture occurred the business meeting. Prof. J. H. Comstock of Ithaca, N. Y., was elected chairman and E. S. G. Titus of Washington, D. C., secretary of the meeting. The new society then adopted a constitution and by-laws and elected officers and the other members of the executive committee.

The following are the officers: President, J. H. Comstock, Ithaca, N. Y., 1st Vice President, James Fletcher, Ottawa, Can., 2nd Vice President, Henry Skinner, Philadelphia, Pa., Sec.-Treasurer, J. Chester Bradley, Berkeley, Cal.

The Executive Committee consists of the officers and the following Fellows: Wm. M. Wheeler, New York, N. Y., John B. Smith, New Brunswick, N. J., Herbert Osborn, Columbus, O., C. J. S. Bethune, Guelph, Can., F. M. Webster, Washington, D. C., and Chas. W. Johnson, Boston, Mass.

Following the business meeting there was a smoker at the Hotel Endicott given by the Brooklyn, Newark and New York Entomological Societies to the Association of Economic Entomologists and the Entomological Society of America.

The executive committee, at a meeting held December 29, decided to call a meeting of the society at Boston, Mass., in connection with the meeting of the International Zoological Congress in August, 1907. Full announcement will be made later. E. S. G. TITUS, *Secretary*.

VALIDITY OF THE CULICID SUBFAMILY DEINOCERITINAE.

BY EVELYN GROESBEECK MITCHELL, WASHINGTON, D. C.

IN the August number of PSYCHE is a very interesting paper on *Deinocerites cancer*, by Mr. Fredrick Knab. He seems, however, to be possessed of certain delusions, which I shall attempt to relieve.

Before proceeding to this, I wish to say that I was partly in error regarding the labial plate of this larva. I described the plate from a single dissected specimen. Mr. Knab has since then shown me the labial plate of another specimen. In this,— and he says this is like others,— the two basal teeth and the central tooth are not, as I said (PSYCHE, Feb. 1906, p. 19, par. 4), longer than the rest, but are evenly graded; nor are the basal teeth spaced off any further than the rest. I believe that I described from a deformed specimen of the true labial plate and not, as Mr. Knab says, from an inner plate, but as the specimen is not now in my possession, I cannot absolutely verify this. I am aware that deformed labial plates are very rare; still I have seen a few. The teeth are otherwise as I described them, and I could tell the plate from any other at a glance, so characteristic is it.

I did not "bring forward as a discovery of Mr. Coquillett" the unusual length of the second antennal joint in the adult. I merely quoted his statement to me as to the *relative length* of this joint in *D. cancer* as compared with the length in all other known forms of Culicidae.

Nor did I assert that *only Deinocerites* possesses a groove in which the mandibles move. It is not the *presence* of this groove but its prominent *angulation* which is characteristic of this larva. Mr. Knab himself admits that this is unusual when he says that though "the same lateral expansion of this region occurs again in the larva of the Sabethid *Lesticocampa lunata*, the modification of the ridge into *rounded* lobes, outward from the maxillae — occurs in *most* mosquito larvae but may be *absent*, as in *Psorophora*." (The italics are mine.) I have not seen a specimen of *L. lunata* and Mr. Knab's figure of it, (The larvae of Culicidae classified as independent organisms, by H. G. Dyar and F. Knab — reprinted from the Jour. N. Y. Ent. Soc., Vol. XIV, No. 4, Pl. XV. Authors separates pub. Mar. 14, 1906 — the paper itself having been published in December), does not show any lateral expansion much resembling that of *Deinocerites*,— which, by the way, has a much more prominent and sharp angulation of the groove than shown in Mr. Knab's ventral view of the head, (Pl. V, PSYCHE, Aug. '06). But even if *L. lunata* had such a groove as

D. cancer, if only these two possess such an angulation surely this may be considered as one of the unusual if not unique characters of the latter larva.

As for the mandibles, I still believe these to be unique. I was careful, in view of possible discoveries, to say, (PSYCHE, Feb. '06, p. 19, last par.), in referring to the outer caudal angle of the mandible of other culicids than *Deinocerites* that "in other mandibles, *so far as the writer can ascertain*, this part forms an even, continuous curve with the rest of the mandible body." I had not then seen even the figure of *C. vector*. The straight, stiff, apparently spineless, (this is strange, as at least one or two rudimentary spines, though often hard to find, are present even on smoothly rounded mandibles), little projection on the outer angle of the mandible of *C. vector* is about as "similar" to the bent, thumblike, somewhat flexible, long-spined appendage on the *D. cancer* mandible as is the atrophied stump tail of a mandril to the prehensile caudal appendage of a South American monkey. Doubtless the projections are homologues. And, pray, on what are classifications based if not on modifications of homologous structures? Also, the outer angle of the mandible of *C. vector* is not, as in *D. cancer*, visible from above. The biting and other parts of the *C. vector* mandible are decidedly of the *Culex* type, as may be plainly seen by comparing them with my figure of a typical *Culex* mandible, (PSYCHE, Feb. '06, p. 11), and with the *Deinocerites* mandible illustrated on p. 17. (This figure, by the way, is, by a misprint, wrongly designated as "Maxilla of *C. salinarius*," which is on p. 20). For the description of a variation of the marginal comb, which agrees with *C. vector*, read par. 2, col. I, p. 13, of the same number.

I have, from the first, regarded *D. cancer* as a primitive type, and it is natural that later developed types should possess atrophied remnants of organs which were well developed in the more primitive forms (such for example, as the spines on the outer caudal angle of the mandible). I find this belief supported by Osten Sacken, who states that he considers the true Nemocera, to which the Culicidae belong, and most of which possess numerous well developed sensory hairs on the antennae, as being a higher development than the Nemocera anomala, which have relatively bare antennae, (Ent. Mon. Mag., XXVII, p. 35). He lays great stress on the characters of eyes and antennae for forming superfamilies among the Diptera. As in the true Nemocera the differentiation of eyes is reduced to a minimum, he gives to the antennal characters, especially the comparative length and abundance of the hairs on the male as compared with the female antennae, the greatest importance. If, then, so great an authority considers antennal characters of this nature as of such moment in differentiating *super*families, how much greater weight must be given to the value of the same characters in the making of *sub*families.

Now in *D. cancer* the antennae of both sexes are unusually long and bear relatively short and few hairs; moreover the antennae of the male have neither longer nor more numerous hairs than those of the female. In all other Culicidae the antennae are comparatively short and with more and relatively longer hairs than in *D. cancer*; and except in the Trichoprosopininae, (which have other distinctive subfamily characters), the male antennae are densely plumose, with much longer and much more numerous hairs than in the female. Therefore according to Osten Sacken's theory, *Deinocerites* is the most primitive.

By the above antennal characters the Culicidae may be divided into three sharply marked primary groups as follows:

Antennae of males with much longer and more numerous hairs than those of the females. Antennae of females with long hairs. Second antennal joint in both sexes less than 8 times as long as wide. Metanotum nude. Outer caudal angle of mandible of larva not thumblike, or flexed, never with long spines or visible from above. Mandibular groove not angulated. Ventral brush present.

Contains the subfamilies Anophelinae, Megarhininae, Psorophorinae, Culicinae, Uranotaeninae.

Antennae of males not more plumose than those of females.

Antennae relatively short, the hairs of the antennae of both sexes well developed, second antennal joint less than 8 times as long as wide. Metanotum bristly. Mandible of larva as in above section. Mandibular groove sometimes angulated, (in *L. lunata*, according to Knab). Ventral brush absent.

Subfamily Trichoprosoponinae.

Antennae long in both sexes, the second joint over 14 times as long as wide, the antennal hairs in both sexes short and sparse. Metanotum nude. Outer caudal angle of the larval mandible visible from above, thumblike, flexed, somewhat movable and with many long spines. Mandibular groove forming a distinct angle below base of antennae. Ventral brush present.

Subfamily Deinoceritinae.

Thus it would seem that the conclusions at which I arrived by a study of the larvae are borne out by the important antennal characters in the adults and that the subfamily Deinoceritinae is at least as well marked as any other.

PARATYLOTROPIDIA BEUTENMUELLERI SP. NOV.

BY ALBERT P. MORSE, WELLESLEY, MASS.

FACIAL costa shallowly sulcate, narrowed above at meeting with vertex. Vertex sub-acute in profile, plane above, its anterior margins angulate over shallow foveolae open below to the antennal fossae. Pronotum evenly tectiform above; the sides plane, meeting dorsum at an angle less pronounced posteriorly; lateral carinae straight, evenly divergent, obsolete near hind margin. Lateral lobes smooth above, longitudinally rugulose below on prozona, coarsely punctate on metazona, flavescent save for narrow fuscous border below lateral carinae. Prosternal spine pyramidal with rounded apex. Metepisternum with distinct ruga. Tegmina short, nearly as broad as long (4 × 5 mm.), truncate, apex broadly rounded, dorsal field broad, scarcely angulate with lateral. Hind femora of moderate size, olivaceous, rufo-flavescent above. Valves of ovipositor strongly exserted, slender, ventro-lateral teeth absent, dorso-lateral edges sinuous, without serrations. Cerci small, triangular, one-and-one-third times as long as wide, acutely pointed. Abdomen keeled above.

Ferruginous brown above, varied with flavescent on the abdomen; flavescent beneath and on sides of head, pronotum, and metepisterna. Hind femora olivaceous; hind tibiae deep red.

Length of body: 27.5; hind fem.: 13.6. Pronotum: prozona, 4, metazona, 3; width of metazona, 5. Tegmina: length, 5; width, 4 mm.

One female. Valley of Black Mt., N. C., Aug. 30, 1906. W. Beutenmüller.

This is a smaller species than *brunneri*, having the general appearance and coloration of several of the brachypterous species of Melanoplus inhabiting the same district. It lacks the conspicuous flavescent lateral stripes on the head, pronotum and tegmina characteristic of *brunneri*, from which it also differs markedly in the structure of those members. Discovery of the male is awaited with interest.

This species, though differing much from *brunneri*, is doubtless congeneric with it and is especially interesting as being the eastern representative of the genus. *Brunneri* occurs locally from Texas to Dakota, being apparently restricted to the undergrowth of open, rather dry, woodlands. It is probable that the present species will be found to have a similar habitat in the East. I take great pleasure in proposing for it the name of its discoverer, in honor of his researches upon the insect fauna of the southern Appalachians.

THE MEGACHILIDAE OF SOUTHERN MAINE.

BY J. H. LOVELL AND T. D. A. COCKERELL.

THE value of the older collections of bees, which usually consist of specimens bearing only locality labels, is greatly impaired by the absence of flower-records; and they require to be supplemented by later and more carefully collected material. It is hardly worth while to-day to make a large collection of bees without placing on record for each specimen the name of the plant species upon which it was captured, the date of visit, and the locality. It is also desirable to observe whether the insect is sucking honey or gathering pollen. As bees are chiefly dependent upon nectar for food and upon pollen for brood-rearing they are of necessity constant and diligent visitors of flowers. Monotropic and oligotropic bees confine their visits to one or a few species of plants, while in the case of polytropic bees the species may fly only a part of the season, as with some species of *Andrena*. Even when the species fly during the entire summer there may be a portion of the time when only one sex is on the wing, as with the females of *Bombus* and *Halictus* in spring. It is evident that accurate flower-records will greatly facilitate both the labor of collection and determination.

Of the nineteen species of Megachilidae enumerated in this paper none so far as is known to the authors are oligotropic. The species of *Osmia* have been taken for the most part in May or June, while the species of *Megachile* and *Coelioxys* have all been collected later than July 9th. None of the species can be said to be common; and most, as an examination of the flower-records given below will show, are rare. *Osmia atriventris* and *O. melanotricha* are most frequently found on the flowers of Rubus strigosus, while *Megachile latimanus* is usually a visitor of the Compositae. These three species are the most common local forms belonging to this family.

OSMIA.

OSMIA ATRIVENTRIS Cr.

1864 *Osmia atriventris* Cr. ♀, Proc. Ent. Soc. Phil. 3: 29.

1903 *Osmia atriventris* Robt. ♀ ♂, Trans. Am. Ent. Soc. 29: 170.

The female has been collected on Rubus strigosus and Epilobium angustifolium and several other plants from June 16th to July 23rd. Three males were taken on Salix, May 6th and 7th, 1905. This species probably occurs throughout New England and the Eastern States; the type locality is Connecticut.

OSMIA MELANOTRICHA n. sp.

♀.— Length 9 to nearly 10 mm.; similar to *O. atriventris* but is usually larger, the Maine specimens of the latter species varying from 7 to 9 mm. When the face of *O. melanotricha* is viewed from above the middle third longitudinally appears to be clothed with much coarse black hair and the other thirds are white haired. This is rather suggestive of *O. albolateralis* Ckll., which, however, has some black hairs on thorax above, black hair on second abdominal segment, etc. Dorsal abdominal segments 3 to 5 are clothed with short black hair, these segments having also a very indistinct submarginal band of short pale hair. The abdominal hair is best seen in lateral view, and is an easily recognizable character. The ventral scopa is dense and black.

Seven females; six on Rubus strigosus, June 16–18; one on Epilobium angustifolium, July 16, 1905.

O. melanotricha occurs also in Colorado; at Ward, Boulder County, altitude about 9000 feet, on flowers of Phacelia (W. P. and T. D. A. Cockerell). The Colorado specimen differs a little from the Maine ones; the flagellum is decidedly reddish beneath, and the front and mesothorax are largely black.

OSMIA GLOBOSA Cr.

1864 *Osmia globosa* Cr. ♀, Proc. Ent. Soc. Phil. 3:36.

The female was taken on the flowers of Gaylussacia resinosa but bears no date (from my notes, however, I learn that I have collected on the flowers of the huckleberry on June 15th. J. H. L.). The specimen was compared with Cresson's type by Mr. H. L. Viereck; it is a little larger and has the pubescence paler.

The type locality is Great Slave Lake. Cresson does not mention any collector but it was probably obtained by Robert Kennicott (*cf.* Pop. Sci. Monthly, Jan. 1906, p. 70). The male which has not been described was collected on Salix, May 7th.

♂.— Length 7 mm. Black, resembles the female, face densely clothed with long white pubescence; antennae wholly dark, extending back as far as the tegulae; pubescence on thorax as in the female long and pale ochraceous. Abdomen subglobose, rather coarsely but shallowly punctured, except on apical margins; basal segment clothed with long white hair; sixth segment concave in lateral view, with thin but long white pubescence, its edge with a feeble hardly noticeable emargination; seventh deeply notched, the points obtuse; stipites large, yellowish, touching at tips, clothed above with very long dull white hair; spurs black.

Closely related to *O. frigida* Sm., separable in the female by the large amount of black hair on face; in the male by the total absence of a fringe of reddish hair on apical margin of fifth abdominal segment, and the black ventral surface of abdo-

men. The globose abdomen separates it at a glance from *O. objecta* Cr. *O. globosa* is easily known from all the Maine species by the entirely black color of the teguments.

OSMIA (LEUCOSMIA) ALBIVENTRIS Cr.

1864 *Osmia albiventris* Cr. ♀ ♂, Proc. Ent. Soc. Phil. 3:31.

One female specimen taken on Rubus strigosus, June 16, 1905. The male was found on the flowers of the blackberry, June 15.

OSMIA INSPERGENS n. sp.

♀.— Length 8 mm., rather stout with globose abdomen. Bluish-green, the head wider than the distance between the wings, densely and finely punctured, clothed with white pubescence; lower part of the clypeus produced, black, covered with very dark brown pubescence; from beneath the edge project two tufts of short stiff red hairs; mandibles deeply punctured, black, tridentate; antennae nearly black. Mesothorax densely and finely punctured, more sparsely in the middle; clothed with long hoary pubescence except upon the dorsum, which is nearly bare; there are no black hairs on vertex or thorax. Wings subhyaline or tinged with dusky, a dark shade in the marginal cell, nervures dark, basal nervure before transverse medial, tegulae rufo-piceous. Legs normal, black, with light hair, fuscous on inner side of tarsi, and at apex of middle tibiae beneath. Abdomen subglobose, greenish-blue, with a bright steely lustre, minutely punctured, 1st segment clothed with white pubescence at base, apical segment with fine white tomentum; ventral scopa dense, silvery-white, black at apex.

One specimen, taken on Vaccinium macrocarpon probably in July. Easily known from *O. albiventris* by the larger size, and dark hair at apex of clypeus, and at apex of abdomen beneath. In the venation it resembles *O. canadensis*, but the clypeus is not at all as in that species.

OSMIA (CENTROSMIA) BUCEPHALA Cr.

1864 *Osmia bucephala* Cr. ♀, Proc. Ent. Soc. Phil. 3:17.

1864 *Osmia latitarsus* Cr. ♂, Proc. Ent. Soc. Phil. 3:20.

1895 *Osmia bucephala* Robt. Trans. Am. Ent. Soc. 22:125.

One male taken May 11, 1905, on the inflorescence of Acer saccharinum. A remarkable species, easily known in the male by the very large hind spurs and peculiar middle tarsi.

HERIADES.

HERIADES CARINATUS Cr.

1864 *Heriades carinatus* Cr. ♀ ♂, Proc. Ent. Soc. Phil. 2:383.

Three males; two taken July 28th, the third on the flowers of Kalmia angustifolia which blooms here in July.

ALCIDAMEA.

ALCIDAMEA SIMPLEX Cr.

1864 *Heriades simplex* Cr. ♀, Proc. Ent. Soc. Phil. 2: 384.

1864 *Alcidamea producta* Cr. ♂, Proc. Ent. Soc. Phil. 2: 386.

1903 *Alcidamea producta* Robt. ♀ ♂, Trans. Am. Ent. Soc. 29: 171.

One female on Epilobium angustifolium, July 30th; two females on cultivated blackberry, June 15th; two males collected on blackberry, June 24th and 25th.

MEGACHILE.

MEGACHILE MELANOPHAEA Sm.

1853 *Megachile melanophaea* Sm. ♀ ♂, Cat. Hym. Brit. Mus. 1: 191.

The female visits Epilobium angustifolium from July 19th to 30th, and has also been collected on Vicia Cracca and Apocymum androsaemifolium. The male has been taken on Rubus strigosus, June 16th, and Vicia Cracca about July 20th. It is related to the western *M. wootoni* Ckll., and to the European *M. circumcincta* Kirby. Friese puts *circumcincta* in *Megachile*, s. str.; Titus refers *melanophaea* to *Xanthosarus*, where it seems rather out of place.

MEGACHILE (XANTHOSARUS) LATIMANUS Say.

1823 *Megachile latimanus* Say, ♂, West. Quart. Rep. Cin. 2: 81.

1853 *Megachile acuta* Sm. ♀, Cat. Hym. Brit. Mus. 1: 192.

The male has not been taken in this locality. The female which is rather common, has been found from July 30th on Carduus odoratus to Sept. 7th on Solidago; also on Inula Nelenium and Aralia hispida.

MEGACHILE (XANTHOSARUS) VIDUA Sm.

1853 *Megachile vidua* Sm. ♀, Cat. Hym. Brit. Mus. 1: 192.

1853 *Megachile frigida* Sm. ♂, Cat. Hym. Brit. Mus. 1: 193.

The female was collected on Carduus odoratus, July 30th; also on Epilobium angustifolium.

MEGACHILE ALBULA n. sp.

♂.— Length 10–12 mm. Black, abdomen parallel-sided, head and thorax densely and finely punctured; face, clypeus, cheeks below, mesothorax, pleurae and sides of metathorax clothed with long white pubescence, some fuscous on vertex, and on each side of middle of mesothorax, separating the lateral white hair from the central bare space. Head broad, clypeus deeply emarginate, mandibles black, 4-dentate varying to 3-dentate, (the third tooth absent), with a large basal tooth

below, middle of lower margin presenting a slight angle; cheeks beneath with a strong but obtuse tooth, hairy without, concave and shining within; antennae black, flagellum slender, obscure reddish beneath, last joint not discoid. Mesothorax densely punctured in front, more sparsely in the middle. Legs black, coxae with strong but only moderately large spines; anterior femora keeled beneath, posteriorly with much white hair, anteriorly except the broad upper margin, yellowish-ferruginous; their tibiae ferruginous beneath, black above; their tarsi flattened and somewhat dilated; the first joint narrowly concave beneath, the concavity light ferruginous and fringed on either margin with short black hair; second joint reddish, cordate; a dense fringe of long white hair behind, from the apical two-fifths of the tibia to the third joint of the tarsus; middle and hind legs ordinary; claws bidentate, without a basal tooth. Wings dusky hyaline, margins not clouded, tegulae brownish-black. Abdomen broad with numerous small shallow punctures; 1st segment clothed with long hoary pubescence; 2nd, 3rd and 4th segments with obscure white fasciae on the extreme sides in apical grooves, but in general effect the abdomen is black and bandless; 6th segment with carina strongly notched, apical margin with two median and two lateral teeth; and in addition a median prominence, all of these being short and relatively inconspicuous; ventral segments four.

Two males on Epilobium angustifolium, July 30th. A very distinct species, superficially like *M. melanophaea.*

MEGACHILE DECIPIENS n. sp.

♂.— Length a little over 12 mm.; width of abdomen about 4 mm.; black, moderately shining; hair of head and thorax long and white, dark fuscous on vertex, middle of mesothorax, and partly on scutellum; mandibles coarsely striato-punctate, the apical tooth large, the second small, the third rudimentary; antennae black, flagellum faintly reddish beneath, last joint not flattened; vertex broad, shining, with scattered punctures, Mesothorax with close and distinct but rather shallow punctures; tegulae black, wings dusky, quite dark; legs black, with white hair, yellowish on inner side of tarsi; anterior coxae with a strong dentiform angle but no spine; anterior tarsi slender and quite simple with a fringe of white hair behind; anterior femora entirely black; claws strongly bifid with no basal tooth. Abdomen rather short, the first two segments with white hair, the others with black hair; hind margins of second and following segments with dense pure white hair bands, on 2nd only at sides, on 3rd and 4th very weak in the middle; 6th segment vertical, with a prominent transverse keel, which is not at all dentate or crenulate, but is very broadly truncate, the truncation concave; beneath there is a median transverse gently rounded elevation, and a very small tooth on each side easily overlooked; ventral segments four.

Two males collected on Rhus typhina, July 10th; and Epilobium angustifolium, July 30th. This is a *Cyphopyga* closely related to *M. montivaga*, but differing in the structure of the apex of the abdomen, and to a considerable extent in the color of the pubescence. *M. decipiens* has been confused with *M.* (*Anthemois*) *infragilis* Cr., but that differs in the color (yellow) of the pubescence, the wings dusky only apically, the smaller size, the dentiform angles on the front coxae, and the structure of the apex of the abdomen.

MEGACHILE RELATIVA Cr.

1878 *Megachile relativa* Cr. ♀, Trans. Am. Ent. Soc. 7: 126.

Female taken on Epilobium angustifolium, July 23rd; Solidago, Aug. 21; Inula Helenium, Aug. 7th; male on Epilobium angustifolium, July 23rd; Solidago, August 21st.

MEGACHILE BREVIS Say.

1837 *Megachile brevis* Say, ♀ ♂, Bost. Jour. Nat. Hist. 1: 407.

Two females; Spiraea salicifolia, August 4th; Solidago, August 28th.

COELIOXYS.

COELIOXYS RUFITARSIS Sm.

1854 *Coelioxys rufitarsus* Sm. ♂, Cat. Hym. Brit. Mus. 2: 271.

1854 *Coelioxys dubitata* Sm. ♀, Cat. Hym. Brit. Mus. 2: 272.

1864 *Coelioxys rufitarsus* Cr. ♂, Proc. Ent. Soc. Phil. 2: 400.

1864 *Coelioxys dubitata* Cr. ♀, Proc. Ent. Soc. Phil. 2: 400.

1897 *Coelioxys rufitarsis* Robt., Trans. Ac. Sci. St. Louis, 7: 345.

Female taken on Carduus arvensis, Aug. 7th; Solidago, Aug. 19: male on Solidago, July 27th.

COELIOXYS SAYI Robt.

1824 *Coelioxys octodentata* Say, ♂, var. a, Long's 2nd Exp. 2: 353.

1837 *Coelioxys octodentata* Say, ♀, Bost. Jour. Nat. Hist. 1: 400.

1864 *Coelioxys octodentata* Cr. ♀ ♂, Proc. Ent. Soc. Phil. 2: 401.

1897 *Coelioxys sayi* Robt. ♀ ♂, Trans. Ac. Sci. St. Louis, 7: 346.

Male collected on Aralia hispida, July 19th; and Epilobium angustifolium, July 30th.

COELIOXYS OCTODENTATA Say.

1824 *Coelioxys octodentata* Say, ♂, (ex. var. a), Long's 2nd Exp. 2: 358.

1864 *Coelioxys brevis* Cr. (not Ev.), ♀ ♂, Proc. Ent. Soc. Phil. 2: 402.

1897 *Coelioxys octodentata* Robt., Trans. Ac. Sci. St. Louis, 7: 345.

One male taken Aug. 11th, on Solidago. These species as commonly recognized have a wide range, and it is not impossible that there are more distinct forms than the nomenclature indicates.

STELIS.

STELIS (MICROSTELIS) FOEDERALIS Sm.

1854 *Stelis foederalis* Sm. ♀ ♂, Cat. Hym. Brit. Mus. 2: 275.

1864 *Stelis foederalis* Cr. ♀ ♂, Proc. Ent. Soc. Phil. 2: 410.

Two females taken on Epilobium angustifolium, July 23rd. A rare species in this locality, also found at Montreal, Canada.

PROCEEDINGS OF THE CLUB.

THE 262d regular meeting of the Club was held on Tuesday evening, December 18, 1906, in the rooms of the Appalachian Mountain Club. Nine members present; President Field in the chair. . . .

The President exhibited a partially developed pupa of *Vanessa antiopa*. A fall having arrested pupation, the small chitinous portion of the pupa which extended from the larval skin, instead of being normal, had assumed the form of the larva's head. He also showed a large mole cricket (*Gryllotalpa* sp.) which injures the tennis grounds in Pernambuco, Brazil, and some small lepidopterous larvae, great numbers of which had infested a barn in Milton, Mass. Discussed by members.

Mr. Johnson showed a specimen of *Tibicen rimosa* obtained by Mr. Frost at Monmouth, Maine. Its distribution and superficial resemblance to *T. septendecim* were commented upon. A new genus, *Okanagana*, has recently been proposed by Distant for this species. He also exhibited specimens of a new Tachinid allied to the genus *Phytomyptera* of Europe. It was bred by Dr. Russell from *Archips cerasivorana*.

The next meeting being the annual meeting of the Club, it was voted that the President should appoint a Nominating Committee. Messrs. Johnson, Emerton and Bolster were appointed. A revised list of names and addresses of members was discussed and referred to Mr. Blackburn.

The meeting adjourned at 9.50.

CHAS. W. JOHNSON,
Secretary pro tem.

PSYCHE

THE NORTH AMERICAN SPECIES OF GLARESIS.

BY H. C. FALL, PASADENA, CALIFORNIA.

AMONG a miscellaneous lot of coleoptera sent me for identification by Mr. Chas. Fuchs of San Francisco about a year ago, were two undescribed species of Glaresis. These latter were retained for study when the lot was sent back, and so escaped the destruction which befell the greater part of Mr. Fuch's collection in the terrible earthquake and fire which devastated San Francisco.

The comparative characters given by Dr. Horn in his descriptions of *G. inducta* and *mendica*[1] are not very pronounced, are subject to some variation, and in respect to the elytral costae are actually misleading, having been — as I later discovered — accidentally reversed. It was thought best therefore to postpone further action till a comparison could be made with the types. Such comparison having been made it now seems proper to present descriptions of the new forms, with some comparative notes.

Glaresis ecostata n. sp.

Moderately robust, very slightly wider posteriorly, rufotestaceous throughout. Mandibles rather deeply sinuate externally; head nearly smooth, not impressed, epistoma squarely truncate. Prothorax of the usual form, apical marginal groove wanting, median groove very faintly indicated, no discal impressions; the linear granular elevations of the surface sparse and indistinct. Elytra with rows of rather small very feebly defined shallow punctures, the intervals slightly convex but not at all costiform, each with the usual line of short suberect fulvous setae. Outer apical angle of middle tibiae only moderately prominent; outer margin of hind tibiae deeply emarginate before the apex. Length 4.5–4.7 mm., width 2.4 mm.

Two examples of this fine species are before me, one taken in June at Pilot Knob (near Yuma) California; the other collected by Dr. Fenyes May 20 at Palm Springs, Cal. It is our largest species, and is, aside from size, at once separable

[1] Trans. Am. Ent. Soc. XII, 1885, p. 117.

from all others by the deeply emarginate hind tibiae and nearly flat elytral interspaces. The hind tarsi decrease notably in width from base to apex the basal joint being almost twice as wide as the apical one. Slight individual differences in the hind tarsi have been noticed in other species and I suspect these to be sexual, there being a tendency in the less robust specimens — presumably males — toward more slender tarsi, with the joints of more uniform width.

Glaresis phoenicis n. sp.

Similar in form to *mendica* and *ecostata*; entirely rufotestaceous. Mandibles strongly obtusely toothed externally. Head very faintly and sparsely tuberculate, smooth behind. Epistoma broadly sinuate. Prothorax without apical groove or discal impressions, the median groove barely perceptible. Elytral costae feeble to moderate, strial punctures usually obscure, but better marked in some specimens. Outer apical angle of middle tibiae strongly produced; hind tibiae feebly sinuate before the apex. Length 3–4 mm.

Phoenix, Arizona. Several examples sent by Mr. Fuchs. Intermediate in size between *ecostata* and the smaller *mendica* and *inducta*. The elytral costae are distinct enough though less sharply defined than in the smaller species. *Phoenicis* differs from all others in the strongly produced outer apical angle of the middle tibiae, and in the strong lobe like tooth of the outer margin of the mandibles, which structure is, however, foreshadowed in *ecostata*.

G. mendica Horn.
G. inducta Horn.

These two species are mutually very closely related and the small differences of sculpture are easily obscured by the indument with which they are frequently coated. *Mendica* is the less robust of the two, the difference being quite obvious when series are compared; the apical marginal groove of the pronotum is well defined, the medial groove deeper, and there are two more or less evident discal impressions before the middle. In *inducta* the thoracic sculpture is generally less pronounced, the apical groove becoming obliterated at middle, the medial sulcus is fainter, and the discal impressions are lacking. The elytral costae are normally quite strong in both, but are rather better developed in *inducta* instead of in *mendica* as stated by Horn. Both species are smaller than *ecostata* or *phoenicis*, ranging in length from 2.8 to 3.6 mm., the latter measurement applying to an unusually robust specimen. In neither species is the outer margin of the mandibles more than very faintly sinuate, nor do either exhibit the tibial modifications possessed by the two new forms.

Mendica was described from Arizona, and has been taken at Palm Springs and Pasadena, California, by Dr. Fenyes and myself. A Lower California specimen sent by Mr. Fuchs and labeled *mendica* by Horn, is apparently a good subspecies, differing from the typical form by its slightly more robust form and more deeply perforate elytral punctures. I am unwilling to give it a name without first seeing other examples.

Inducta, described from Western Texas, has been collected by Rev. Birkmann at Fedor, in Central Texas, and five specimens are now before me. It is probable that this species may be safely identified by its locality label.

The more important characters of our four species are summarized in the following table.

1. Outer margin of hind tibiae deeply emarginate before the apex; elytral interspaces merely slightly convex . . . . . *ecostata.*
   Outer margin of hind tibiae not or but slightly emarginate; elytral interspaces more or less distinctly costiform . . . . . 2.
2. Outer apical angle of middle tibiae strongly acutely produced; prothorax without apical marginal groove . . . . . *phoenicis.*
   Outer apical angle of middle tibiae not strongly produced; post-apical impression of prothorax distinct, at least at sides . . . . . 3.
3. Post-apical groove of prothorax deeper at sides, nearly obsolete at middle; anterior discal impressions wanting; form stouter . . . . . *inducta.*
   Post-apical groove distinct from side to side, not much deeper laterally; anterior discal impressions distinct; form less robust . . . . . *mendica.*

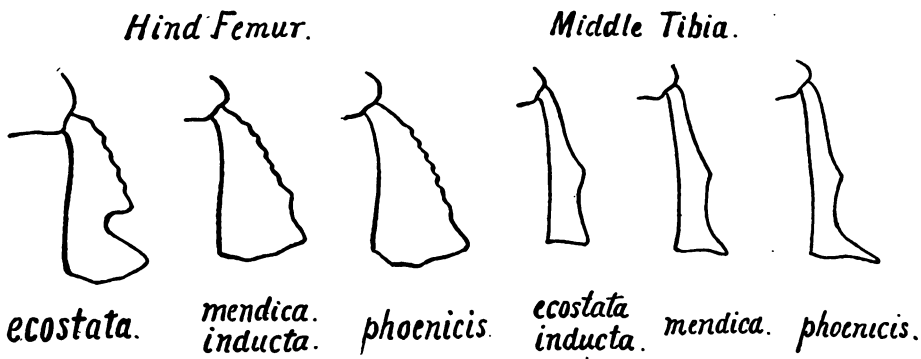
Certain differences in the armature of the posterior trochanters and femora should here be noticed though I have not thought best to introduce them in the preceding table, it being possible that with larger material they may prove to be in some degree variable or sexual in nature. They are however practically constant within specific limits in the material at hand, in which it is probable that — in some species at least — both sexes are present.

In all the species except *ecostata* there is a small spiniform tooth near the outer extremity of the postero-superior margin of the hind trochanters. This tooth is not visible directly from beneath, being concealed by the more prominent lower margin of the trochanter, but may be viewed obliquely from behind. In *ecostata* — as if to make up for this omission — the lower visible edge of the trochanter bears two small rather distant teeth, no trace of which exists in the other three species, the posterior edge of the trochanter being obtusely angulate however in *phoenicis*. In all the species except *phoenicis*, the postero-superior margin of the hind femora

bears near the middle one or two very small acute or spiniform teeth, these as before being visible only from the rear; and here again by way of compensation *pheonicis* has the lower visible margin of the thigh with a more or less acute tooth close to the junction with the trochanter, there being no sign of this in either of the other species.

In the Hungarian *frivaldskyi*, as exemplified by a specimen sent by Mr. Fuchs, the thoracic sculpture is more pronounced than in any of our species, the postapical and median grooves being deeper and the disk with four well defined impressions; the mandibles are moderately sinuate externally, the outer apical angle of middle tibiae not much produced, the hind tibiae more deeply emarginate subapically than in any of our species except *ecostata*. The posterior trochanters have a minute tooth at the outer extremity of lower margin, the superior margin with a very small vestigial tooth, the hind thighs not perceptibly toothed. The elytral costae are well developed and the size is nearly that of our own *mendica* and *inducta*.

The following simple diagrammatic sketches exhibit with a fair degree of accuracy the tibial differences alluded to above.



HOSTS OF INSECT EGG-PARASITES IN NORTH AND SOUTH AMERICA.

BY A. ARSÈNE GIRAULT, WASHINGTON, D. C.

THE following compilation of the hosts of the insect egg-parasites is made for several reasons, the most important of which is the labor which it saves by bringing together the much scattered rearing records of these insects. Other reasons are the importance of egg-parasites as a class, the aid given in identifying the parasites of any one host, and the interest which a compilation of this kind is likely to stimulate in the minds of economic entomologists for whom this list is primarily intended.

The list considers the parasites from the standpoint of the host only, and it is not meant to bring out any important biologic facts concerning them, which should be considered rather in a list of the parasites and their hosts or host relations. Mainly, it answers but one question, "What parasites attack the egg of *Carpocapsa pomonella*, or other insect?" It is complete up to the end of the year 1906, and includes none but true, internal parasites of the egg, insects that pass their entire life-cycle within the egg of another insect excepting as adults. Insects that prey on the eggs, such as *Pimpla*, *Anthomyia*, *Sarcophaga*, *Eunotus*, often called egg-parasites, are not considered as such, and are therefore ignored; and parasites that oviposit on or into the egg, becoming fatal during some phase of postembryonic development of the host, through polyembryonic development, are also excluded, being considered parasites of the larva or pupa as the case may be. I consider *Platygaster herrickii* Packard a case in point.

The hosts are arranged alphabetically according to order, genus, and species, merely for the sake of convenience. A query preceding the parasite listed under any host, questions the record in one way or another; insects of doubtful generic position are enclosed within quotation marks New records are preceded by an asterisk. References to the literature are given in the most convenient way possible, and the nomenclature and synonymy are according to the latest authorities. Incomplete records are entirely omitted in the list, excepting in the case of a few important or suggestive ones. The record of the rearing of *Ablerus clisiocampae* Ashmead from the eggs of *Malacosoma americana* Fabricius has been proven to be undoubtedly incorrect, but in order to point out this mistake in as forcible a manner as possible, I have thought it wise to include it in the list of parasites of that host, there calling attention to the error. In this way, I doubly insure attention being drawn to the mistake. *Anopedius error* Fitch, erroneously recorded from the eggs of *Nabis*

ferus Linnaeus, is treated in a like manner; it is a larval parasite of certain Diptera. And attention is also directed to the record of *Elasmus albicoxa* Howard from eggs of *Basilarchia archippus* Cramer, more or less discredited by both Howard and Ashmead (the latter, *in litt.*); and to the erroneous record of *Hadronotus leptocorisæ* Howard on *Leptocorisa tipuloides* DeGeer (Ashmead, 1887 b, p. 119; id., 1893 a, p. 231). *Polyneura* (Webster, 1903, p. 33) should be *Polynema*, so Mr. Webster informs me. The list requires no further explanation.

Our knowledge of egg-parasites does not compare favorably with that of the parasites of the larva. But for the writings of Howard, Ashmead, and Riley and Howard, the recorded rearings would be very meagre indeed. It is mainly through the efforts of the two former, that so much is now known of this most important class of insect parasites, and we are at the present day much more advanced in this respect than are our European neighbors.

Egg-parasites are not difficult to rear, and being, perhaps, the most potent enemies of many of our injurious insects, it is desirable that greater care and more thoroughness be taken in rearing work; so that on account of their minute size, they are not overlooked.

In connection with this list, I mention some of the insects which are known to be hosts of egg-parasites, the latter still unknown. In the Lepidoptera, *Anisota rubicunda* Fabr., *Euproctis chrysorrhoea* Linn. (Europe), *Junonia coenia* Hübner, *Malacosoma disstria* Hübner, *Megathymus yuccæ* Boisd. et Leconte, *Paonius excaecatus* Smith et Abbot, *Thorybes pylades* Scudder, and *Vanessa cardui* Linn. have been recorded as being attacked by egg-parasites. Among the Hemiptera is *Serinetha trivittata* Say; the hymenopterus genus *Hylatoma* is probably attacked by the eulophid *Hyperteles hylatomae* Ashm. (Ashmead, 1888, Canadian Ent., XX, p. 105); while certain Odonata (Howard, 1901, Insect Book, p. 366) are also recorded to be hosts of egg-parasites. A species of "*Trichogramma*" probably attacks *Hemerobius* (Howard, Hymenoptera, in Stand. Nat. Hist., Boston, p. 511).

The insect egg-parasites of the Americas are all hymenopterous, as far as we know definitely at the present time. The majority of them belong to the superfamilies Chalcidoidea (mostly the families Trichogrammidae and Mymaridae, and the following: — the family Torymidae <*Podagrion* only>; Eurytomidae <Rileyini, — *Macrorileya* and *Neorileya*>; and the Encyrtidae <Eupelminae,— *Eupelmus*, *Anastatus*; Encyrtinae,— *Oöencyrtus*, *Dinocarsis*> and Proctotrypoidea (mostly the Scelioninae, comprising *Phanurus*, *Telenomus*, *Trissolcus*, *Aradophagus*, *Prosacantha*, *Caloteleia*, *Baryconus*, *Macroteleia*, *Cacus*, *Hadronotus*, *Idris*, and *Scelio* in the tribes Telenomini, Teleasini, and Scelionini respectively, and the sub-

family Ceraphroninae <*Aphanogmus* only>. Outside of these two superfamilies, certain of the Evaniidae (namely *Evania*) of the superfamily Ichneumonoidea are also egg-parasites of the true insects, the cockroaches.

The most prominent and common of the genera of egg-parasites are undoubtedly *Trichogramma* and *Telenomus*, and of the species, *Trichogramma pretiosa* Riley is foremost, attacking no less than eleven or more hosts. *Telenomus graptae* Howard follows as the second most common species, attacking six hosts.

Other genera and doubtless families in the Chalcidoidea and Proctotrypoidea will be found to be parasitic on the eggs of American insects when we become more advanced in our knowledge of them. In Hawaii, for example, such has been found to be the case (Perkins, 1905, p. 200 *et al*; 1906), and also in Europe in a few cases. The foregoing enumeration of parasitic families and genera, therefore, cannot be said to be restrictive.

The known hosts of egg-parasites in continental North and South America comprise the following orders as listed: Coleoptera, Diptera, Hemiptera, Hymenoptera, Lepidoptera, Neuroptera, and Orthoptera, and in addition the Odonata. The families attacked in each order, where numerous, are widely separated, and in this respect the parasites seem to have very little choice. In order of being most attacked, in number of species, the Lepidoptera are first, then the Orthoptera, Hemiptera, Coleoptera and Hymenoptera.

Hosts and their parasites.

Coleoptera.

Host	Parasite.	Authority.
Attelabus bipustulatus Fabricius	*Poropoea* species	Hopkins, 1905, p. 132.
Chlaenius impunctifrons Say	*Prosacantha caraborum* Riley	Ashmead, 1893a, pp. 180, 191, 451.
Conotrachelus nenuphar Herbst	*Anaphes conotracheli* Girault	Girault, 1905, Ent. News, XVI, p. 220.
Fidia viticida Walsh	*Brachista fideae* Ashmead	Webster, 1896, p. 69.
	Fidiobia flavipes Ashmead	Slingerland, 1906, p. 93.
Odontota dorsalis Thunberg	*Trichogramma odontotae* Howard	Chittenden, 1902, p. 82.
Pityopthorus consimilis Leconte	? *Aradophagus fasciatus* Ashmead	Ashmead, 1893a, p. 166.
querciperda Schwarz	? *Aradophagus fasciatus* Ashmead	Dalla Torre, 1898, p. 512. *Cf.* Ashmead 1893a, p. 166.
Scarites subterraneous Fabricius	*Prosacantha caraborum* Riley	Riley & Howard, 1891, p. 124.
Tachypterus (*Anthonomus*) *quadrigibbus* Say	? *Gonatocerus anthonomi* Girault	Girault, 1905, Ent. News, XVI, p. 289.

Diptera.

Tabanus atratus Fabricius	*Phanurus tabanivorus* Ashmead	Ashmead, 1895, pp. 274–275.

Hemiptera.

Anasa tristis DeGeer	*Eupelmus reduvii* Howard	Ashmead, 1887a, p. 190.
	Hadronotus carinatifrons Ashmead	Girault, 1904, Ent. News, p. 336.
	Hadronotus rugosus Howard	Riley & Howard, 1891, p. 124.
	Hadronotus anasae Ashmead	Howard, 1888, p. 129.
	Oöencyrtus anasae Ashmead	Chittenden, 1899, p. 26.
Apiomerus spissipes Say	*Hadronotus* species novem.	Morgan, 1907, p. 54.
Arilus cristatus Linnaeus	* *Anastatus giraulti* Ashmead MS.	Girault, MS. notes, 1903.
	Eupelmus reduvii Howard	Howard, 1880, Can. Ent., XII, p. 208.
	* *Oöencyrtus johnsoni* Howard	Girault, MS. notes, 1905.
Brachyrhynchus granulatus Say	*Aradophagus fasciatus* Ashmead	Dalla Torre, 1898, p. 512. *Cf.* Ashmead, 1893a, p. 166.
Brochymena arborea Say	*Trissolcus brochymenae* Ashmead	Dalla Torre, 1898, p. 512.
species (on currant)	*Telenomus perplexus* Girault	Girault, 1906, Psyche, XIII, p. 66.
Ceresa bubalus Fabricius	*Trichogramma ceresara* Ashmead	Ashmead, 1888, Can. Ent. XX, p. 107.
	Polynema (*Cosmocoma*) species novem.	Riley, 1894, p. 215.
Coccus hesperidum (Linnaeus)	? *Trichogramma flava* Ashmead	Howard, 1888, p. 131.
Dysdercus suturellus Herrick-Sch.	? *Hadronotus rugosus* Howard	Riley & Howard, 1891, p. 124. Discredited by Ashmead, 1893a, pp. 232, 451.
Euschistus fissilis Uhler.	* *Trissolcus euschisti* Ashmead	Girault, MS. notes, 1905.
servus Say	*Trissolcus euschisti* Ashmead	Ashmead, 1893a, pp. 162, 451.
tristigmus Say	* *Trissoleus euschisti* Ashmead	Girault, MS. notes, 1905.
Euthoctha galeator Fabricius	? *Hadronotus rugosus* Howard	Ashmead, 1893a, pp. 232, 451.

Homalodisca triquetra Fabricius	*Ooctonus homalodiscae* Ashmead	Sanderson, 1906, p. 51.
Icerya purchasi Maskell	? *Phanurus opacus* Howard	Ashmead, 1893a, p. 142.
	? *Alaptus iceryae* Riley	Riley, 1888, Ins. Life, I, p. 130.
Largus succinctus Linnaeus	*Hadronotus largi* Ashmead	Dalla Torre, 1898, p. 498.
Lepidosaphes ulmi (Linnaeus)	? *Anaphes gracilis* Howard	Howard, 1888, p. 130.
Liburnia species	*Anagrus columbi* Perkins	Perkins, 1905, p. 198.
Metapodius femoratus Fabricius	*Hadronotus floridanus* Ashmead	Riley & Howard, 1891, p. 124.
Murgantia histrionica Hahn.	*Oöencyrtus johnsoni* Howard	Johnson, 1900, p. 21.
	Trissolcus murgantiae Ashmead	Morgan, 1897, pp. 140, 141, 159.
	podisi Ashmead	
Nabis ferus Linnaeus	? *Anopedius error* Fitch	Riley, 1880, pp. 196–197. *Cf.* Ashmead, 1893a, p. 291.
Pentatoma ligata Say	*Telenomus ashmeadi* Morrill.	Morrill, 1907, p. 10.
sayi Stål		
Podisus modestus Dallas	*Telenomus podisi* Ashmead	Ashmead, 1893a, p. 451. *Cf. ib.*, p. 159.
Podisus maculiventris Say	*Hadronotus* species nov.	E. Potts, 1891, Ent. News, II, pp. 53–54.
	? *Telenomus dimmocki* Ashmead	Dimmock, 1897, p. 148.
	Telenomus podisi Ashmead	Ashmead, 1893a, p. 159.
	Trissolcus podisi Ashmead	Riley & Howard, 1891, p. 124.
	? *Trissolcus thyantae* Ashmead	Dalla Torre, 1898, p. 512. *Cf.* Ashmead, 1893a, p. 163.
Thyantha custator Fabricius	*Trissolcus thyantae* Ashmead	Ashmead, 1893a, p. 163.
Tibicen septendecim Linnaeus	*Aphanogmus floridanus* Ashmead	Riley & Howard, 1891, p. 123. Queried by Ashmead, 1893a, p. 451.
	Lathromeris cicadae Howard	Howard, 1898, Can. Ent., XXX, pp. 102–103.
Zelus bilobus Say	*Hadronotus leptocorisae* Howard	Riley & Howard, 1891, p. 124. *Cf.* Ashmead, 1893a, p. 231, & 1887 b. p. 119.
longipes Linnaeus	*Hadronotus leptocorisae* Howard	Ashmead, 1887b, p. 119.

Hymenoptera.

Anthophorabia species	*Packardiella putnamii* Packard	Packard, 1880, p. 202.
Caliroa (*Selandria*) *obsoleta* Norton	*Trichogramma minuta* Riley	Morgan, 1897, pp. 144, 159.
Eriocampoides limacina Retzius (= *Selandria cerasi* Peck)	"*Encyrtus*" species	Marlatt, 1897, p. 6.
Isosoma captivum Howard	? *Oligosita americana* Ashmead	Webster, 1903, p. 35.
grande Riley	? *Oligosita americana* Ashmead	Webster, 1903, p. 22.
hordei Harris	*Oligositaamericana* Ashmead *Polynema* ((?) *Polyneura*) *citripes* Ashmead	Webster, 1903, p. 33.
tritici Fitch	? *Oligosita americana* Ashmead	Webster, 1903, p. 22.
Pachynematus palliventris Cresson	? *Trichogramma pretiosa* Riley	Fletcher, 1893, p. 159. *Cf.* Riley & Howard, 1893, p. 289.
Pteronus ribesii Scopoli	*Trichogramma pretiosa* Riley	Howard, 1888, p. 124.

Lepidoptera.

Aglais milberti Godart	*Trichogramma intermedia* Howard	Scudder, 1889, I, p. 429.
Alabama argillacea Hübner	*Trichogramma pretiosa* Riley	Riley, 1879, Can. Ent., XI, pp. 161–162.
Alsophila pometaria Harris	"*Platygaster*" species	Riley. Packard & Thomas, 1883, p. 176.
	* *Telenomus gnophaelae* Ashmead	Girault, MS. notes, 1905.
Anosia plexippus Linnaeus	*Trichogramma intermedia* Howard	Howard, 1889, p. 1895.
Automeris io Fabricius	*Eupelmus* species	Howard, 1891, p. 568.
Autographa brassicae Riley	*Trichogramma pretiosa* Riley	Howard, 1888, p. 124.
Basilarchia archippus Cramer	*Trichogramma minuta* Riley	Fletcher, 1893, p. 160
	Trichogramma minutissima Packard	Scudder, 1889, I, p. 279.
	? *Elasmus albicoxa* Howard	Howard, 1885, p. 30. *Cf. id.*, Ins. Life, IV, p. 253.
Bellura gortynides Walker (= *densa* Walker)	*Telenomus arzamae* Riley	Ashmead, 1893a, pp. 158, 450.

Calpodes ethilius Cramer	*"Trichogramma"* species. A chalcid	Cockerell, 1892, Ent. News, III, p. 79.
Carpocapsa pomonella (Linnaeus)	*Trichogramma pretiosa* Riley	Slingerland, 1896, p. 70.
Chlorippe clyton Boisduval & Leconte	*Telenomus rileyi* Howard	Riley & Howard, 1891, p. 123.
Datana interregima Grote & Robinson	*Telenomus gossypiicola* Ashmead	Morgan, 1897, pp. 149, 159.
ministra Drury	*Eupelmus* species	Howard, 1891, p. 568. vide Dimmock, 1885, p. 279.
Diacrisia virginica Fabricius	*Telenomus spilosomatis* Ashmead	Riley & Howard, 1891, p. 123.
Euvanessa antiopa Linnaeus	*Telenomus graptae* Howard	Bruner, 1890, p. 103.
Gnophaela latipennis Boisduval	*Telenomus gnophaelae* Ashmead	Riley & Howard, 1891, p. 123.
Heliothis obsoleta Fabricius	*Telenomus heliothidis* Ashmead	Riley & Howard, 1891, p. 123, *cf.* Mally, 1893, p. 25.
	Trichogramma pretiosa Riley	Howard, 1888, p. 124.
	Trichogramma pretiosa nigra Girault	Girault, 1906.
Hemerocampa leucostigma Smith & Abbot	*Telenomus orgyiae* Fitch	Riley, 1887a, p. 32. *Cf.* Howard, 1897, pp. 7, 30–31, 52, & Hulst. 1889, p. 205. vide Packard, 1890, p. 265.
	Trichogramma fraterna Fitch [1]	Dalla Torre, 1898, p. 3.
	Trichogramma orgyiae Fitch [1]	
Heodes hypophleas Boisduval	*Telenomus graptae* Howard	Scudder, 1889, II, p. 1008.
Heterocampa bilineata Packard	*Telenomus graptae* Howard	Howard, 1894, p. 280.
Hyphantria cunea Drury	*Telenomus bifidus* Riley	Riley, 1887b, p. 531.
	Trichogramma species	Bruner, 1890, p. 43.
textor Harris	*Telenomus bifidus* Riley	Riley & Howard, 1891, p. 124.
Ianassa lignicolor Walker	*Trichogramma pretiosa* Riley	Dyar, 1893, p. 256.
Laphygma frugiperda Smith & Abbot	*Trichogramma pretiosa* Riley	Riley, 1885a, p. 104.
Malacosoma americana Fabricius	? *Ablerus clisiocampae* Ashmead [2]	Ashmead, 1893b, p. 10.

[1] For the validity and synonymy of these two species, *cf.* Riley, 1887, p. 32, Packard, 1890, p. 265, and Howard, 1897, p. 7.

[2] Undoubtedly incorrect; a parasite of various species of Coccidæ, *cf.* Howard, 1894, p. 6, and others.

	"Pteromalus" species	Packard, 1880, p. 207, fig. 139.
	"Platygaster" species	Glover, 1877, p. 102.
	Telenomus clisiocampae Riley	Ashmead, 1893a, pp. 160, 450.
Malacosoma (Clisiocampa) species	*Telenomus clisiocampae* Riley	Ashmead, 1893a, p. 160.
Mamestra picta Harris	*Telenomus heliothidis* Ashmead	Davis, 1893, p. 26.
	Telenomus species novem	Fletcher, 1893, p. 161.
	Trichogramma pretiosa Riley	Fletcher, 1893, p. 161.
Melalopha inclusa Hübner	*Telenomus ichthyurae* Ashmead	Riley & Howard, 1891, p. 123.
Mompha (Laverna) luciferella Clemens	*Telenomus lavernae* Ashmead	Riley & Howard, 1891, p. 123.
Notolophus antiqua Linnaeus	*Telenomus orgyiae* Fitch	Howard, 1897, p. 30.
Notolophus (Orgyia) species	*Telenomus californicus* Ashmead	Ashmead, 1893a, pp. 150, 450.
	Telenomus orgyiae Fitch	Ibid., p. 153.
Oeneis macounii Edwards	*Trichogramma intermedia* Howard	Howard, 1889, p. 1895.
Paleacrita vernata Peck	*"Platygaster"* species	Riley, 1870b, p. 103.
Paonius myops Smith & Abbot	? *Eupelmus* species	Howard, 1891, p. 568.
Papilio glaucus Linnaeus	*Trichogramma minutissima* Packard	Scudder, 1889, II, p. 1304.
Papilio glaucus turnus Linneaus	*Trichogramma intermedia* Howard	Fletcher, 1893, p. 160.
	Trichogramma minutissima Packard	Fletcher, 1893, p. 160.
Phlegethontias sexta Johanssen	*Telenomus sphingis* Ashmead	Ashmead, 1893a, pp. 156, 450.
	Trichogramma pretiosa Riley	Ashmead, 1887c, p. 17.
Platynota rostrana Walker	*Trichogramma pretiosa* Riley	Hubbard, 1885, p. 153.
Polychrosis viteana Clemens [1]	* *Trichogramma pretiosa* Riley	Johnson, Fred, MS. notes, 1906.
Polygonia interragationis Fabricius	*Telenomus graptae* Howard	Riley & Howard, 1891, p. 123.
	Trichogramma intermedia Howard	Howard, 1889, III, p. 1895.
progne Cramer	*Telenomus graptae* Howard	Howard, 1889, III, p. 1891.

[1] North East, Penn.

Sanninoidea exitiosa (Say)	*Telenomus quaintancei* Girault	Girault, 1906, Psyche, XIII, p. 64.
Schizura leptinoides Grote	*Telenomus caelodasidis* Ashmead	Ashmead, 1893a, p. 159.
Sphida (Arzama) obliqua Walker	*Telenomus arzamae* Riley	Riley & Howard, 1891, p. 123.
Telea polyphemus Cramer	*Telenomus sphingis* Ashmead	Dimmock, 1897, p. 148.
	Eupelmus species	Howard, 1891, p. 568.
Thanaos lucilius Lintner	*Trichogramma intermedia* Howard	Scudder, 1889, II, p. 1467.
Therina fervidaria Hübner, *somniaria* Hulst	*Telenomus* species novem	Fletcher, 1893, p. 160.
Thymelicus cernes Boisduval & Leconte	*Telenomus graptae* Howard	Scudder, 1889, II, p. 1731.
Thyridopteryx ephemeraeformis Haworth	*Dinocarsis thyridopterygis* Ashmead	Ashmead, 1886, p. 98.
Vanessa atalanta Linnaeus	*Trichogramma minutissima* Packard	Howard, 1889, p. 1895.

Neuroptera.

Chrysopa perla (Linnaeus) species	*Telenomus* species	Howard, 1888, p. 123.
	Telenomus chrysopae Ashmead	Ashmead, 1893a, pp. 159, 451.

Orthoptera.

Amblycorypha oblongifolia DeGeer	*Anastatus mirabilis* Walsh.	Riley, 1870a, pp. 296–297, 369–370.
Blatta orientalis Linnaeus	*Evania appendigaster* (Linnaeus)	Marlatt, 1902, p. 11.
	Evania species novem	Cockerell, 1894, p. 209.
Blattella germanica (Linnaeus)	*Evania appendigaster* (Linnaeus)	Marlatt, 1902, p. 11.
Chortophaga viridifasciata DeGeer	? *Scelio oedipodae* Ashmead	Morgan, 1901, p. 24.
	? *Scelio hyalinipennis* Ashmead	Morgan, 1901, p. 24.
Dichromorpha viridis Scudder	*Scelio* species	Warner, 1903, pp. 308–309.
Dictyopterus reticulatus Thunberg	? *Scelio fuscipennis* Ashmead	Ashmead, 1893a, p. 243. *cf.* Dalla Torre, 1898, p. 495.
Dissosteira carolina Linnaeus	*Scelio ovivorus* Riley	Riley & Howard, 1891, p. 124.
Ischnoptera pennsylvanica DeGeer	*Evania dorsalis* (Westwood)	Ashmead, 1900, p. 7.

Mantis brasiliana Linnaeus	*Podagrion melleum* Westwood	Dalla Torre, 1898, p. 369.
Melanoplus atlantis Riley	*Scelio calopteni* Riley	Ashmead, 1893a, pp. 246, 451.
differentialis Thomas	*Scelio hyalinipennis* Ashmead	Morgan, 1901, p. 23.
	Scelio oedipodae Ashmead	Morgan, 1901, p. 23.
species	*Scelio luggeri* Riley	Riley & Howard, 1891, p. 124.
spretus Thomas	? *Scelio ovivorus* Riley	Riley, Packard & Thomas, 1878, pp. 305–306. *Cf.* Psyche, IV, 1883, p. 78.
Microcentrum retinerve Burmeister	*Anastatus mirabilis* Walsh	Hubbard, 1885, pp. 134–135.
Oecanthus fasciatus Fitch	*Anastatus mirabilis* Walsh	Ashmead, 1894, p. 245.
latipennis Riley	*Cacus oecanthi* Riley	Riley & Howard, 1891, p. 124.
	Caloteleia species	Bruner, 1890, p. 126, footnote.
	"*Rileya*" species	Bruner, 1890, p. 126, footnote.
nigricornis Walker, *niveus* DeGeer	*Anastatus mirabilis* Walsh,	Felt, 1906, p 699.
	Baryconus oecanthi Riley	Dalla Torre, 1898, p. 501.
	Cacus oecanthi Riley	Dalla Torre, 1898, p. 500.
	Caloteleia species	Bruner, 1890, p. 126, footnote.
	Idris species	Webster, 1891, pp. 345–346.
	"*Rileya*" species	Bruner, 1890, p. 126, footnote.
species	*Macrorileya oecanthi* Ashmead	Ashmead, 1904, p. 264.
"*Oedipoda*" species	*Scelio oedipodae* Ashmead	Dalla Torre, 1898, p. 495.
Orchelimum agile DeGeer	*Eupelmus xiphidii* Ashmead	Morgan, 1901, p. 31.
	Macroteleia sp., near *floridana* Ashmead	Morgan, 1901, p. 31.
glaberrimum Burmeister	*Macroteleia floridana* Ashmead	Ashmead, 1893a, p. 451. *Cf.* pp. 217–218.
	Macroteleia virginiensis Ashmead	Ashmead, 1893a, p. 218.
Periplaneta americana Linnaeus	"*Eulophus*" species	Westwood, 1839, p. 423.
	Evania appendigaster (Linneaus)	Ashmead, 1900, p. 7.
	"*Pteromalus*" species	Westwood, 1839, p. 423.
australasiae Fabricius	*Evania appendigaster* (Linnaeus)	Ashmead, 1900, p. 7.
Schistocerca americana Drury	? *Scelio hyalinipennis* Ashmead	Morgan, 1901, p. 24.
	? *Scelio oedipodae* Ashmead	Morgan, 1901, p. 24.
melanocera Stål	*Scelio ernstii* Riley	Riley & Howard, 1891, p. 124.
obscura Fabricius	*Scelio hyalinipennis* Ashmead	Morgan, 1901, p. 28.

	Scelio oedipodae Ashmead	Morgan, 1901, p. 28.
peregrina Olivier	*Scelio ernstii* Riley	Riley, 1885b, p. 22.
Stagmomantis carolina Linnaeus	*Podagrion mantis* Ashmead	Morgan, 1897, p. 159.
limbata Saussure	? * *Podagrion mantis* Ashmead	H. S. Barber, 1906, *In litt.*

Acknowledgments.

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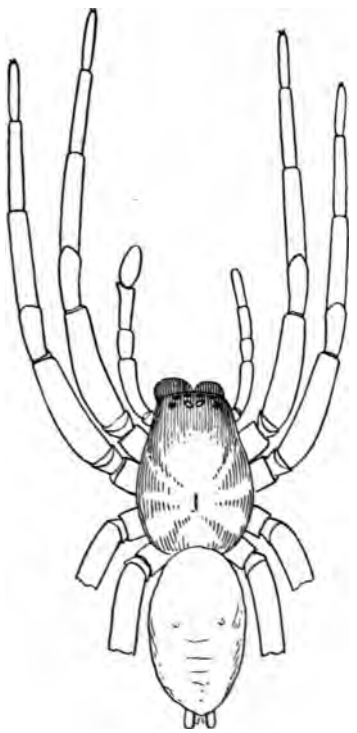
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A FEMALE SPIDER WITH ONE MALE PALPUS.

BY J. H. EMERTON, BOSTON, MASS.

THIS is a large specimen of *Drassus saccatus* Em. collected with other spiders by Miss E. B. Bryant at Long Island, Portland, Me., Aug. 10, 1906, without its peculiarities being noticed at the time it was taken. The general appearance is that of an old female of large size with the abdomen small and shrivelled as in a female that has laid eggs. The epigynum is complete and symmetrical as in a normal female. The cephalothorax and abdomen are symmetrical and the third and fourth legs are alike on both sides. The right palpus is that of a female and the left that of a male with the palpal organ fully developed. The first and second legs of the left side are slightly longer than those of the right side. The left mandible is thicker than the right and the claw is slightly longer but the mandible is not elongated nor narrowed at the tip as it is in the male. Asymmetry of any kind is rare in spiders. Prof. W. M. Wheeler has called my attention to a case described by Kulczynski in one of the publications of the Cracow Academy of Sciences in 1885. This was an *Erigone fusca* Blk. which had the right side like the female and the left like the male. The epigynum was developed only on the right side and the asymmetry extended to the form of the cephalothorax and abdomen and even the spinnerets. The legs however were symmetrical in length, the only difference being in those of the first pair which had the right tarsus like the female and the left like the male.



THE SNOW-FLY, *CHIONEA VALGA* HARRIS.

BY CHARLES W. JOHNSON, BOSTON, MASS.

THIS species was evidently discovered by T. W. Harris prior to 1833, for in his list of the Insects of Massachusetts, in Hitchcock's Report on the Geology, etc., of Massachusetts, 1833, page 593, he refers to it as "Chionea — one species." In the second edition of Hitchcock's Geology, etc., 1835, page 575, the specific name *valga* is given. Harris's first edition of his Report on the Insects of Massachusetts injurious to vegetation appeared in 1841, in which, on page 404, he refers to this insect as follows: — "There are exceptions to almost all general rules. Thus we find, among Dipterous insects, some kinds that never have wings. One of these is the thick-legged snow-gnat, or *Chionea valga*. This singular insect looks more like a spider than a gnat. Its body is rather less than one fourth of an inch long, and is of a brownish yellow or nankin color. The legs are rather paler, and are covered with short hairs. The head is small and hairy. The first two joints of the antennae are thick, the others slender and tapering and beset with hairs. Although the wings are wanting, there is a pale yellow poiser on each side of the hinder part of the thorax. The hindmost thighs are very thick, and somewhat bowed in the males, which suggested the name of *valga*, or bow-legged, given to the insect in my catalogue. The body of the female ends with a sword-shaped borer, resembling that of a grasshopper. These wingless gnats live on the ground, and the females bore into it to lay their eggs. They are not common here."

The above was reprinted in the second edition, 1852, page 482, and in the third or Flint edition in 1862, page 601; in the latter a poor figure is given. This constitutes the only description given by Harris, but it seems sufficient to identify the species, and his type (the female) is still in good preservation; of the male only the genitalia remain.

Mr. P. H. Gosse in his book entitled "The Canadian Naturalist," published in 1840, refers to them as "being doubtless the *Chionea araneoides*." He found them crawling on the snow, in pine woods, during the month of March.

In the brief and inadequate descriptions given by Walker of his two species, *C. aspersa* and *scita* (List I, p. 82, 1848), there seem to be no characters to separate them from *valga*.

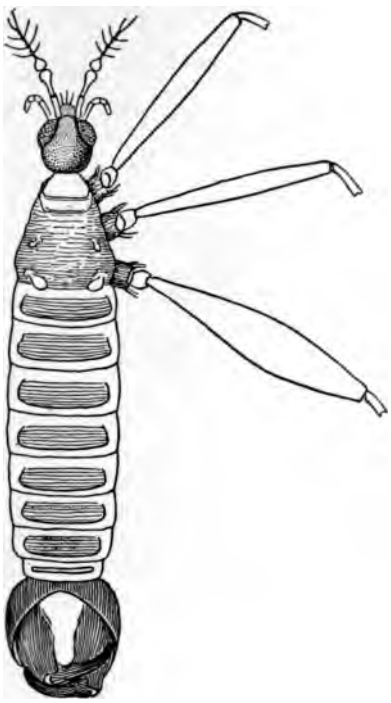
The description of *C. nivicola* Doane (Journ. N. Y. Ent. Soc., VIII, p. 189, 1900), based only on the female, agrees very closely with the female of *C. valga*,

except that the antenna has eight joints. Schiner (Fauna Austr., II, p. 573, 1864), describes the European species as having six-jointed antennae. Osten Sacken (Mon. IV, p. 168) in referring to this, says:—"It seems to me that I can count four joints in the only specimen in my possession." The "four joints" refers only to the flagellum, making seven joints in all. The six specimens before me (including the type) all have seven joints. It seems singular that there should be this discrepancy in the antennæ, a generic character. The description of *C. nivicola* also calls for six abdominal segments (an unusual number for a Tipulid). A comparative study of the American and European forms seems very desirable.

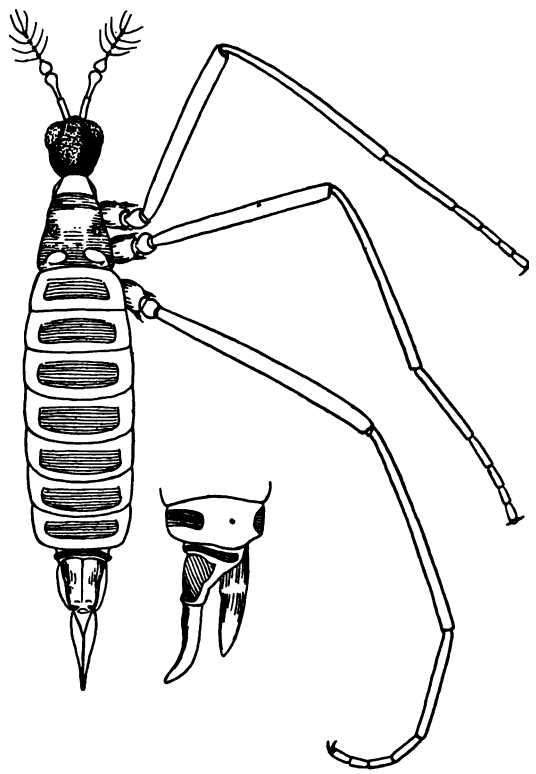
Owing no doubt to its peculiar habits, it is rarely observed, and there are comparatively few records since its discovery by Harris more than eighty years ago. It has been found in Minnesota, and described and figured by the late Otto Lugger in his second annual Report, page 230, plate XVI, 1896. Later Mr. F. L. Washburn in the Tenth Annual Report, page 30, 1905, gives another figure of the species. It represents a male; the abdomen seems to be entirely too broad, and the genitalia are poorly shown. In the Canadian Entomologist for August, 1906, p. 275, Mr. C. N. Ainslie also records it from Minnesota.

Through the kindness of Mr. J. H. Emerton I am able to again record this species from New England. During a trip to the White Mountains Mr. Emerton was fortunate in finding this interesting species, and in regard to its capture says:—"Three males and one female of this rare insect were found walking slowly about on the snow, in sheltered places on the edge of the woods at Jackson, N. H., February 20, 1907. This was the last of several warm days when the snow had been melting in the sun at noon. The snow was two to three feet deep but there were open spots around larger trees and stones through which insects might come from the ground. The published figures of New England specimens are small and indefinite. I therefore give new drawings of both sexes." These specimens have been presented to the Boston Society of Natural History. There are also in the collection of the Society the type, and a specimen presented by Mr. Samuel Henshaw, which was taken by Mr. H. L. Moody at Malden, Mass. There is little to add to the descriptive remarks by Harris, and the description by Osten Sacken. The excellent figures by Mr. Emerton show clearly the genitalia and antennae, and also two minute protuberances which would indicate the normal position of the wings; these are quite distinct in the fresh specimens, which are preserved in alcohol, but in dried specimens seem to be obliterated. The three males collected by Mr. Emerton show considerable variation; the one figured measures about 6 mm., the other only about 4 mm. In one specimen the hind femora are scarcely thickened. The larva

of *C. araneoides* of Europe lives in the ground, apparently upon vegetable matter. It has been described and figured in detail by Brauer (Verh. Zool. Bot. Ver. in Wein, IV, p. 609, 1854). Our species probably has similar habits. A larva found



Chionea valga, ♂.



Chionea valga, ♀.

by Mr. Emerton in sifting for spiders, he thought might possibly belong to this species, but the structure of the head and posterior segment is very different from the larva figured by Brauer.

PSYCHE

BIOLOGICAL NOTES ON THE COLORADO POTATO BEETLE, *LEPTINOTARSA DECEMLINEATA* (SAY), WITH TECHNICAL DESCRIPTION OF ITS STAGES.

BY A. A. GIRAULT AND A. H. ROSENFELD.

DURING the spring and summer of 1906 it became convenient to make a brief study of this insect, more in reference to the biological aspects of its life than otherwise. There seem to be but few records in our literature concerning the duration of its different stages, especially in the southern United States. The following facts are therefore presented for publication without further comment. The observations were made at Myrtle, Ga., about 32 degrees, 30 minutes north latitude.

THE EGG.

Description.— Length, 1.70–1.80 mm.; 1.75 mm., average. Width, 0.80 mm., average, greatest diameter. Body uniformly bright orange, opaque, the ends paler, yellowish, and translucent. Shape elongate oval, the outline slightly irregular, and the caudal end or base, and the apex, regularly rounded. Surface simple, glabrous, apparently very minutely punctulate, with a moist appearance. Micropyle simple, inconspicuous. Chorion soft, easily crushed, and more or less elastic. To the naked eye, conspicuous.

Deposited erect, in small irregular masses of 20 or 30, more or less, generally on the under surfaces of the leaves. Caudal end held by a small orange pad of adhesive matter. (From many specimens.)

External Development.— The egg shows no sign of embryonic development externally until about the twelfth hour before hatching, when the perfect embryo is visible, together with all of the markings of the first larval instar at eclosion. The ocellar spots are in a rectangle at the anterior end of the egg, and the larger lateral tubercle areae and spiracles are distinctly visible on the sides. The setae are visible as blackish streaks along the sides in nearly regular rows. The disposition of the appendages is not distinct. The markings are more distinct as the egg approaches the time of hatching.

Duration of Stage.— In all the period of incubation for five hundred eggs has been determined to the hour, as accurately as possible under laboratory conditions.

Table I. Length of Period of Incubation at Different Dates, Myrtle, Ga. 1906.

Lot. no.	No. eggs.	Deposited. Time	Hatched. Time	Length of Stage Days	Hours.	Effective Temp Degrees F.
1.	40.	May 21, 3:30 A.	May 26, 12:30 P.	5	9.	33.°
2.	53.	22, 5:00 A.	27, 5:00 P.	5	12.	32.67.
3.	30.	22, 1:30 P.	28, 3:30 A.	5	14.	33.50.
4.	41.	23, 8:45 P.	29, 11:00 A.	5	14¼.	33.21.
5.	9.	24, 1:45 A.	29, 11:00 A.	5	9¼.	33.75.
6.	40.	24, 9:00 P.	30, 7:30 A.	5	10½.	33.61.
7.	33.	25, 1:00 P.	30, 10:45 P.	5	9¾.	33.46.
8.	38.	26, 2:45 P.	31, 8:00 P.	5	5¼.	33.79.
9.	41.	27, 12:00 M.	June 1, 3:30 P.	5	3½.	34.53.
10.	23.	28, 12:30 P.	2, 1:45 P.	5	1¼.	35.95.
11.	39.	29, 3:25 P.	2, 10:10 P.	4	6½.	35.44.
12.	23.	30, 11:45 A.	3, 8:45 P.	4	9.	37.64.
13.	35.	31, 1:00 P.	4, 3:00 P.	4	2.	38.89.
14.	20.	June 2, 3:00 P.	6, 8:45 P.	4	5¾.	40.10.
15.	14.	3, 4:45 A.	7, 8:00 A.	4	3¼.	40.
16.	21.	3, 5:00 P.	8, 8:00 A.	4	15.	40.50.
Averages				4	23	35.62.°

Glancing down the column, it is seen that even during the short period of two weeks, there is a gradual decrease of the period of incubation, and a correspondingly gradual increase of the sums of effective temperatures. The exceptions are due to short cool spells.

The average of 35.62 degrees F. agrees well with most of the average sums of effective temperatures shown in the table.

Period of Hatching. The period of hatching of an egg-mass varies somewhat, but averages about three hours under usual spring conditions. The eggs in any single mass hatch almost simultaneously.

Number Deposited.

The data obtained on this point consists of but a single record, obtained by confining a pair of adults with food. These were captured *in copula* at 5 P. M. May 20, 1906, and then confined. The female deposited eggs as follows: —

Table II. Number of eggs deposited by a single female in confinement.

Date.	Mass Number.	No. Eggs.
May 21.	1.	40.
22.	2.	53.
22.	3.	30.
23.	4.	16.
23.	5.	41.
24.	6.	9.
24.	7.	40.
25.	8.	33.
26.	9.	38.
27.	10.	41.
28.	11.	23.
29.	12.	39.
30.	13.	23.
31.	14.	35.
June 2.	15.	20.
3.	16.	14.
3.	17.	21.
5.	18.	9.
		525

Period of Oviposition. From the table just given, it is seen that, in this case, the period of oviposition lasted for over fifteen days. However, this female was probably some days old when captured, so that the record is not complete, and a much longer period than this may be expected.

The Larva.

Description of the Instars. The larva or grub of the Colorado Potato Beetle is of the usual cruciform type, with a large, fleshy, subovate, prehensile body, antenniferous and hexapod, and bearing a terminal proleg. It is an external and voracious feeder, and grows rapidly, but is sluggish in habit.

Immediately following exclusion from the egg, the larva is entirely light orange (unicolored), with the following exceptions,— ocellar spots reddish, tubercle areas blackish, minute, inconspicuous, excepting three large areas, one on the dorso-lateral aspect of the last two thoracic and the first abdominal segments; tibiae and tarsi paler, translucent; apical end of the antennae and the tips of the tarsi dusky; cervical and anal shields concolorous. Dorsal aspect, body uniformly orange yellow,

paler at anal end, the three large tubercle areas above mentioned conspicuous, followed by the minute and much less conspicuous spiracles. Mandibles reddish brown; anal proleg large, paler. After several hours the larva becomes normally colored for the first instar.

Instar I.	Length after exclusion —	1.50 mm., avg.
	Length before ecdysis —	2.60 mm., avg.
	Width of head —	0.65 mm., avg.

Body fleshy, from cephalic aspect tubular, from dorsal aspect gourd-shaped; dorsal plane at head and thorax, inclined, at abdomen greatly convexed; lateral aspect, ventral plane straight, or slightly concaved near caudal end; with nine abdominal segments, the anal segment bearing a pair of prehensile prolegs. Body thickest at 4th abdominal segment, narrowed at head and thorax, and tapering caudad. Stigmata distinct, circular, and similar on thorax and abdomen; black.

Head peltate, narrower than following segment, flat, directed ventrad, glabrous black, subhirsute, rather soft, though chitinous. Ocelli six, 4 arranged so as to form a square, the remaining two in a line on the lateral aspect of the head; the lateral two ocelli, of the four in a square, are ocellate with orange; all slightly protuberant, and black. Antennae 3-jointed, the first joint paler, joints 1 and 2 subequal, broader than joint 3; the apical joint conical, ending in three or four stiff, sensory setae, and paler distally (dorsal aspect); in reality (lateral aspect) black, nearly uniform in width, the distal joint apparently 2-branched, its dorsal branch much the larger, cylindrical and truncate, and the ventral branch slender, conical, and spine-like, in reality, a spinous prolongation of the ventro-cephalic angle of joint 3 (the appendix).

Mandibles short and broad, at base about two-thirds as wide as long, pale yellowish, fuscous at tips, subrectangular, outer margin slightly curved and convex, the inner margin shorter and irregular; with four strong acute serrations, of which the first three are about equal in size, the second, however, about one-third longer, the fourth or inner one-half shorter and blunt. Maxillary palpi 3-jointed, longer than the antennae; labial palpi 2-jointed; both apparently with an additional basal joint, evidently a portion of the stipes; both paler at tip. Labrum broad, notched at the median line. Maxillary and labial palpi both bear sensory setae.

Thorax cylindrical, prothorax largest, its shield covering nearly the whole of the dorsum, black and divided by a thin median line concolorous with body; tubercles more abundant on the shield. Thoracic segments corrugated, the sclerites inconspicuous.

Legs black, the articulations paler, 5-jointed (usual leg joints), the coxa broad, tibia and femur subequal in length, the former more slender; from dorsal aspect (natural position), most of the tibia and all of the tarsus visible. Tarsi, 1-jointed,

bearing a single, large, sharp claw, which is pale and bent sharply ventrad, the empodium apparently simple. Legs with sparse, stiff, long hairs; ambulatorial and subscansorial.

Abdomen fleshy, abruptly convex above, slightly concave below, widest at about the 4th segment; surface microscopically papillose, from naked eye smooth and shining. Cerci absent. Articulations indistinct. Scansorial.

Body marked as follows—Head, cervical and anal shields, legs, median line of abdomen, stigmata, and most of the tubercle areae, black; trochanters pale. The tubercle areae are arranged as follows: —

Segment I—As in instar II.

II—As in instar II; an additional flat round area, rotato-rugose, just above the large area, and in dorsal region, 2 transverse areae, at cephalic and caudal margins of the segment respectively.

III—Same as in instar II; with the additions as noted for segment II.

IV—Same as in instar II. Two additional areae in a longitudinal line just above each spiracle, coalesced, forming a crescent; in dorsal region, 4 areae, the first 2 coalesced, arranged in an irregular square, on each side of meson.

V–IX—Same; the two above the spiracle on segment 3, with an arm joining them. The 2 cephalic ones in dorsal region not coalesced; the cephalic one in that region minute, the next twice larger, and the 2 caudal ones subequal, at least 7 or 8 times larger than the cephalic one.

X—The same. The 4 in dorsal region closer, the 2 cephalic ones nearly in a transverse line at cephalic margin of segment; the 2 caudal ones, included with the cephalic margin of the anal shield, which covers portions of this segment, caudad.

XI—Tubercles still closer together, those above, in the shield; areae smaller. Apparently the same.

Instar II.	Length after exclusion —	2.80 mm., avg.
	Length before ecdysis —	5.3 mm., avg.
	Width of head —	1.09 mm., avg.

Following the first ecdysis, the whole body is a bright crimson, the head and prothorax brighter, the ocelli and most of the tubercle areae black. Exuvium entire, black.

The same. Body more tubular (dorsal aspect); from lateral aspect, ventral surface nearly regularly concave, the dorsal surface convex, the convexity abruptly broken at segments 2 and 3, which are concave; from dorsal aspect, body narrower

at thorax, widest at 2nd abdominal segment, and subacute at anal extremity; declivous at 5th or 6th abdominal segment.

Head the same, more rounded posteriorly, black, nearly as wide as the thorax, bearing scattered minute tubercles from each of which arise single, moderately long setae; head hispid, surface subscabrous. Ocelli inconspicuous; antennae the same, inserted below the center of the face, the first joint pale, the third joint pale at apex, the appendix pale; antennae retractile. Mandibles the same, relatively broader, darker, subtriangular, the outer margin subsinuate and more straight, the inner emarginate, the teeth stronger, the outer one slightly shorter, the inner or 4th more obtuse, nearly truncate. Maxillary palpi with basal joint pale. Clypeus broad and narrow.

Thorax narrower than in instar I, in proportion to body; the same. Legs the same, stouter, the claw fuscous.

Abdomen convex, oval, naked, ambulatorial, but with a single pair of prolegs situate at anal extremity; segmentation more or less distinct, ventral surface concave; ninth segment prehensile. Anus terminal. Cerci absent.

Body marked as follows—Head, cervical shield, some of the tubercle areae, legs, and anal shield, black, the latter rather dusky; cervical shield paler, subochreous near cephalic margin; remainder of the body ochreous. The prominent black tubercles and spiracles are arranged as follows: —

Segment I — The oval, dusky spiracle is on lateral aspect, contiguous to the base of the leg.

II — 2 areae on lateral aspect in a line cephalo-caudad, the more dorsal one larger; 4 on the dorsum in a square; 2 linear areae on each side of the meson.

III — The same; the two lateral areae in a line ventro-dorsad, the dorsal one much larger.

IV–XI — Lateral aspect, two large rounded areae in a line ventro-dorsad, subequal, forming a double line of dots along the side of abdomen; the dorsal ones are spiracles. On segments IX, X, and XI, paler, brownish, the dorsal areae much smaller (minute on XI and near anal shield), but more black.

Remaining areae very minute, but a longitudinal line on sides of ventum of abdomen are inclined to be conspicuous (segments IV–X). Anal shield quadrate, including segments XI and XII, forming a rectangle on each segment. A median line of black, fading caudad.

Instar III. Length after exclusion — 5.45 mm., avg.
Length before ecdysis — 8.50 mm., avg.
Width of head — 1.67 mm., avg.

The same. Dorsal body more convex, the 2nd and 3rd thoracic segments inclined; widest at third abdominal segment.

Head relatively wider, at least five times wider than long, anterio-posteriorly, its greatest transverse diameter just caudad of the insertion of the antennae; sculptured into irregular polygons by fine lines. Ocelli black, convex. Antennae, maxillary and labial palpi, the same. Mandibles stronger, more broad and triangular, the teeth forming a broad apex, rather than a fourth side; the 2nd tooth by far the largest, the 4th or mesal one truncate. Clypeus with three equal tubercles in an oblique (cephalo-laterad) transverse line, on each side of the meson, each bearing a single seta. Mandibles black along their outer edges.

Prothoracic segment much the largest, the shield peltate, emarginate along caudal margin; second segment at times partially concealed. Stigmata of prothorax round, large black areae, more caudad. Legs the same; tibia rectangular, slightly longer than the femur, and at least one-third narrower; claw and empodium orange yellow; coxa large and conical; trochanter subtriangular.

Abdomen the same, more convexed, prehensile, thicker laterad than dorso-ventrad; segmentation more distinct, surface minutely papillose, from naked eye, smooth.

Body markings the same, more distinct. Cervical shield bordered with ochreous at cephalic margin, involving also portions of the lateral margins, anteriorly; portions of the legs ochreous. Stigmata in large, oval, glabrous black areae, simulating coalesced tubercle areae, as in instar II. Tubercle areae the same, the anterior pair on dorsum of 2nd and 3rd thoracic segments subobsolete; the lateral areae on abdomen subequal.

Instar IV. Length after exclusion — 9.00 mm., avg.
Length before ecdysis — 15.00 mm., avg.
Width of head — 2.50 mm., avg.

The same. Prothoracic segment conspicuous, much wider than segments 2 and 3, and often completely concealing segment 2. Body widest at segments 3 and 4 of abdomen; more elongate, with the ventral surfaces more straight or flat, and with the outlines from dorsal aspect sinuate. Convexity of dorsal surfaces less apparent.

Head more conspicuous, more round, nearly one-half narrower than the first thoracic segment, ovalin actual outline; its greatest transverse diameter passes between the caudal and the intermediate groups of two of the ocelli; face engraved, sculpture of head slightly stronger. Ocelli and antennae the same, black. Mandibles fuscous, darker at the teeth, at base nearly as wide as long; teeth stouter and less acute.

Thorax less inclined, the prothoracic segment from dorsal aspect conspicuous, wider than the two following segments, the shield covering most or whole of the dorsal surface, and overlapping much of the mesothoracic segment, and lateral aspect of segment 1, twice wider than long and not emarginate at is caudal margin. Legs the same, the coxae of the second and third pairs not as large as those of the foreleg. Body of claw straight.

Abdomen the same, less convex dorsad, and more flat ventrad, very prehensile; more corrugate.

Body markings the same. Median line of head and thorax ochreous, that of abdomen, dusky. Face ochreous, or mostly so, and also most of the occipital region of the head. Cervical shield concolorous with body, bordered caudad with black, its caudal edge ochreous, Stigmatal areae larger, conspicuous, glabrous black, irregular, equal or subequal on first 4 abdominal segments, slightly smaller on the fifth, one-third smaller on the sixth, two-thirds smaller on the seventh, and on the eighth abdominal segment minute, partially concealed in the incision of segment 7. Anal shield black. Proleg orange. Coxae and trochanters concolorous with body, as is also the mentum.

First pairs of tubercle areae on dorsum of meso- and metathoracic segments inconspicuous, sometimes apparently obsolete; the dorsal one on lateral aspect of the same segments more prominent, conical. The line of small areae on ventro-lateral aspect of abdomen less distinct. Shields of legs black. There are three small round tubercle areae also visible on the caudal margin of the 7th abdominal segment, on each side of the median line, just cephalad of the anal shield; they are flat, rotato-rugose. They are also present on the cephalic margin of that segment, observed when that margin is visible.

Just previous to pupation the body of the larva becomes contracted, and the prothoracic segment swollen; the body is also more convex, and the legs are applied close to the ventum. The colors fade slightly. The larva is then perfectly motionless in its cell in the ground.

Described from a lot of 10 larvae reared under similar conditions.

Duration of larval instars. Three separate lots were reared with this object in view, comprising a total number of nineteen larvae. Two lots were run together in field and laboratory and practically agreed in the duration of the different instars. The third lot (lot No. 2 in the table), was not supplied with soil after the third ecdysis, and pupated nakedly, apparently after the normal period, thus giving the actual length of instar IV. It is interesting to note in this connection that the time of ecdysis for lots of larvae of the same age was nearly simultaneous, all molting within a period of three or four hours.

Table III. Duration of larval instars.

Lot No.	No. larvæ	Date of Hatching	1st Ecdysis Instar I	2nd Ecdysis Instar II	3rd Ecdysis Instar III	Entered Soil Instar IV	Sums
1[1]	5	P.M., May 26	A.M., May 29 2½ days	P.M., May 31 2¼ days	A.M., June 2 2¾ days	P.M., June 5 3¾ days	11¼ days
2	9	6 A.M., June 16	12-30 P.M., June 18 2 days, 6½ hours	3 P.M., June 20 2 days, 2½ hrs.	4 P.M. June 22 2 days, 1 hour	7 A.M., July 1[2] 8 dys., 15 hrs.	15 dys., 1 hr.[3]

Additional records of the actual length of the combined larval instars made in the first two weeks in June, ranged from 16 days, 5 hours to 17 days, 9 hours, the records obtained from but three larvae.

Time in soil previous to pupation. Two records of this give 2 days, 16 hours as the time spent by the larva in the soil previous to pupation. This, of course, varies much with the individual, and we are inclined to think the period somewhat longer on an average.

Eating of eggs in confinement by starved larvae. Whenever egg-masses were brought in from the field and confined in the laboratory, the young larvae finding no food after hatching, would invariably turn their attention to the yet unhatched eggs in the mass, and commence to feed on them. We have seen the entire mass thus destroyed by one or two prematurely hatched larvae.

The Pupa.

Description. Length, 9.20 mm., average; greatest width, 6.40 mm., 1st abdominal segment. Broadly ovate, angular, convex above, straight or slightly concaved below; naked. Color orange yellow, abdomen, wings, and legs orange, the median line of abdomen deeper orange; setae brownish; eyes change from pale to crimson and then, after 36 to 48 hours, to orange, with discal surfaces dusky; prothoracic tubercles black; a broad dusky line on dorso-lateral aspect of segments 2 to 5 of abdomen, not contiguous to the spiracles; spiracles black; tip of cremaster black.

Antennae inserted so that at least one-third, the whole of the basal third, is visible from ventral aspect, and from dorsal aspect, its apical third; they cross the base of the eyes and proceeding caudo-laterad (ventral aspect), go beneath the femora of the first and intermediate pairs of legs, where they are almost hidden; their tips reach to the knees of the intermediate legs. Articulation distinct.

Elytra large and rather conspicuous, their basal half plainly visible from ventral aspect, and from dorsal aspect, a longitudinal half of their base is visible. They

[1] Duplicated in the field.
[2] Actual pupation.
[3] Actual length of the combined instars, including time in soil previous to pupation.

extend caudo-laterad and then ventrad, between the intermediate and posterior legs. Their tips are opposite to the penultimate tarsal joint of posterior legs. The antennae reach to about their middle and are applied to them.

Stigmata of prothorax visible from ventral aspect; ovate. Those of abdomen visible from dorsal aspect, smaller and rounded oval, those of the first abdominal segment partially concealed.

Setae generally absent, except as mentioned in following; irregular, of medium size, and generally originating from distinct tubercles or papillae.

From dorsal aspect.— Head entirely concealed by prothorax, the latter visible for caudal two-thirds. The knees and tips of the femora of the first and intermediate legs project side by side, from the center of their respective segments; the knees of the first pair of legs are slightly caudad of the insertion of the elytra; those of the intermediate pair are slightly cephalad of the center of the elytra, and are advanced farther laterad; more of the femur of the first pair of legs is visible. The knees of the third pair of legs project from beneath the elytra at the third abdominal segment; the knee alone is visible. The elytra are visible for at least their basal three-fourths. Other appendages not visible. The cremaster visible for its entire length.

Prothorax semicircular in outline, the cephalic edge slightly concave, the lateral edges truncate, the caudal edge curved, and convex at median line; surface convex, with a thin median furrow. About one-third wider than long. In the disk, on each side of and along the median line, the pronotum bears about 13 to 15 rather conspicuous setae arising from small black tubercles; and the entire margins bear many setae, which are inclined to be grouped at the angles. At the dorso-lateral aspect, there is also a group of less conspicuous setae, of 5 or 6.

Mesothorax as wide as the prothorax, but nearly one-third shorter; nearly three times wider than long. The scutellum regularly peltate, convex, transversely striate, naked. Devoid of setae.

Metathorax slightly wider than prothorax, and about twice longer than mesothorax; with a deep median furrow. Surface glabrous. The thorax about equals the abdomen in length; the segmentation is not distinct.

Abdomen with greatest transverse diameter in the third segment. It tapers but slightly cephalad, but rather abruptly caudad, after the 5th segment, reaching a point in the cremaster. Setae are borne on the caudal margins of the segments, few mesad, numerous laterad, and thick near the spiracles. Segmentation distinct. Seen from lateral aspect, segments 1 to 6 are ridged the ridge cushion-like, and with a deep impression in the disk. Cremaster fleshy, turned dorsad.

Ventral view.— Head semicircular, with a thin median furrow, the tips of the mandibles reaching a point opposite the insertion of the first pair of legs; front

impressed, with long scattered setae which are not present on the vertex, except laterally. Surface of the eye punctate. The large distal joint of the maxillary palpi is visible, and also the tips of the distal joint of the labial palpi. Each mandible bears at its extremity an acutely conical process, fleshy like a nipple. The maxillary palpi reach the tarsi of the first pair of legs.

Legs compact, the first and intermediate pairs with their femora contiguous. The tarsi of the first pair are applied to the base of the tarsi of the intermediate pair. The tarsi of the posterior pair project from beneath the elytra; the tips of the tarsi of the intermediate pair, which run parallel to the elytra, are applied to the tarsi of the posterior pair. Setae on legs sparse, mostly on knees and tarsi. Ventum of abdomen mostly concealed, a portion of the disk visible.

External development. There are no marked color changes in the pupa during the period just previous to exclusion to the adult. Following pupation, the colors are brighter, and the markings more or less faded, but this is not particularly striking.

Duration of Instar.

1. *Actual Duration.* The table which follows gives the actual length of the pupal instar, obtained by allowing larvae to pupate in vials without soil; in three cases, records were obtained by observations on larvae which had pupated at the sides of glass jars filled with soil, and these in nowise differed from the other records, ranging from six to eight days. The actual pupal instar and the time spent in the soil are very different in duration, and hence should be considered apart.

Table IV. Actual Pupal Instars.

No.	Pupated	Excluded	Length; days	hrs.
1.	5 P. M., May 25th.	6 A. M., June 1st.	5	13.
2.	6 P. M., May 26th.	7 A. M., June 1st.	5	14.
3.	10 A. M., June 10th.	4 P. M., June 16th.	6	6.
4.	10 A. M., June 10th.	Noon, June 18th.	8	2.
5.	7 P. M., June 18th.	2 P. M., June 25th.	6	19.
6.	11 P. M., June 19th.	Noon, June 23rd.	3	13.
7.	11 P. M., June 19th.	11 A. M., June 25th.	5	12.
8.	Noon, July 4th.	10 A. M., July 9th.	4	22.
		Sums.	46	5
		Average.	5	19

2. *Length of time in Soil.* Records of this are tabulated, for convenience of comparison with the table just presented.

Table V. Actual Time Passed in Soil.

No.	Entered soil for pupation.	Emerged.	Length; days	hours.
1.	10 P. M., May 22nd.	7 A. M., June 2nd.	10	9.
2.	10 P. M., May 22nd.	6 A. M., June 2nd.	10	8.
3.	10 P. M., May 22nd.	6 A. M., June 2nd	10	8.
4.	10 P. M., May 22nd.	3 P. M., June 3d.	11	17.
5.	8.30 P. M., June 8th	8 P. M., June 23d.	14	23½.
6.	3 P. M., June 11th.	5 P. M., June 21st.	10	2.
7.	2 P. M., June 11th.	9 A. M., June 23d.	11	19.
8.	5 P. M., June 11th.	11 A. M., June 22nd.	10	18.
9.	Noon, June 12th.	9 A. M., June 23d.	10	21.
10.	P. M., June 11th.	P. M., June 22nd.	11	
11.	4 P. M., June 11th.	Noon, June 22nd.	10	20.
12.	3 P. M., June 11th.	10 A. M., June 22nd.	10	19.
13.	2 P. M., June 11th.	7 A. M., June 24th.	12	19.
		Sums.	146	15½
		Average.	11	7

Length of time in soil after eclosion. Two records obtained, give this period as 3 days, 12 hours, and 4 days, 8 hours respectively. By comparing these with the tables in foregoing, they are apparently about correct, the average being about three and a half days.

The Adult.

Changes in color following eclosion. The changes in coloration undergone by the adult immediately following eclosion, have already been amply described and figured (Tower, 1903), so that no mention of them will be made here.

Length of life in confinement. We have but a single record of this, for a pair of adults captured *in copula*, 5 P. M., May 20th, and at once confined with food. The male died on June first, having lived 12 days. The female lived until June 7th, or 18 days. As already intimated, we may expect a much longer length of life than this, as both adults were probably some days old when captured.

Copulation and oviposition. The female of this pair deposited 525 eggs from May 21 to June 5th, in masses ranging from 9 to 53 eggs each, and with an average of 29.1 eggs to the mass. The daily rate of deposition was about the same as the average number of eggs per mass. Thus she averaged daily a mass of 29.1 eggs.

During the period of confinement, the pair were observed *in copula* no less than eleven times, or nearly once daily. On May 20th, they were observed to mate three

times, and twice on the day following. Then again on May 23rd, and then once daily from May 26th to May 30th, inclusive. The act is normal for the Coleoptera.

Length of life cycle. The lengths of the different stages have already been tabulated. Taking the averages from these and combining them we get the average length of the life cycle, as follows: —

Length of the egg stage —	4 days, 23 hours
Length combined larval instars —	11 days, 6 hours.
Length time in soil —	11 days, 7 hours.
Average length of life cycle,	28 days.

Number of Generations in Georgia. Unfortunately we were unable to gather any definite data bearing on this, but our observations lead us to believe that there are at least three full generations of this insect in this locality of Georgia. This statement is made with qualification.

Natural enemies. During late May, an adult of *Sinea diadema* Fabricius was captured with a larva of instar III impaled on its beak. The body of the larva was partly collapsed. In confinement, this same individual Sinea destroyed several other larvae in different instars. We are indebted to Mr. Otto Heidemann, United States National Museum, for the determination of this insect.

No true insect parasites were met with.

LITERATURE REFERRED TO.

1903. Tower, W. L. The development of the colors and color patterns of Coleoptera, etc. Decennial publications, University of Chicago, X, 40 pp., 3 pls.

These notes are published through the kindness of Dr. L. O. Howard, chief of the Bureau of Entomology, U. S. Department of Agriculture.

PODISMA AUSTRALIS NOM. NOV.

Strict rules of nomenclature seem to require a different name for the species described (Psyche, xiii, p. 120, 1906) as *Podisma scudderi*, in consequence of the fact that *Melanoplus scudderi* was once referred to this genus (Walker, Cat. Derm. Salt. Brit. Mus., iv, 718).

A. P. MORSE.

ON SOME UNRECORDED GENERIC AND SPECIFIC NAMES.

BY A. N. CAUDELL, WASHINGTON, D. C.

Intentionally or otherwise a large number of generic names proposed by Gistel in his Mysteries of the European Insect-world[1] have never been recorded in any of our nomenclatures or indices. Most of the genera here proposed are not described but have one or more described species cited under them, which gives them a valid standing. Duplication of these names is certain, sooner or later, to result in confusion and to prevent, so far as possible, such duplication some bibliographer, preferably a coleopterist, should go over the work and list such new or emended generic names as seem eligible for recording. All the valid generic names used by Gistel in this work as new or emendations, nearly 250 in number, are coleopterous except *Cephalomantis* and *Chersomantis*, both Orthopterous. These two genera are established on page 427 and are from Egypt. *Chersomantis* bears no generic description but the single included species, *picta*, is briefly defined as "antennis crassis; alis inferioribus basi adustis." *Cephalomantis* is described at some length and under it are listed two new species, the first, *rustica*, defined as "3″ lang; hellbraun" and the second, *gracilis*, defined as "Muschelbraun" and doubtfully referred to as a variety of the first. A third species, *viridipennis*, is included but, being undescribed except as characterized by the specific name itself, I consider it a nomen nudum. These two genera of Orthoptera are certainly well established and should be recorded.

Besides *Cephalomantis* and *Chersomantis* and their included species there are several other species of Orthoptera, as well as a number of species of other orders, here defined for the first time.

In Orthoptera the following new species are not found in Kirby's recent Universal Catalogue.[2]

Blatta pellucida	p. 427.	Mantis cinerea	p. 427.
" sphaerica	427.	" dilaticollis	427.
" pallida	427.	" maculipennis	427.
" elongata	427.	Forficula bicolor	427.
" lata	427.	" apicalis	428.
" hemialata	427.	Truxalis pharaonica	428.
Acrydium scutellatum	427.	Gryllus reticulatus	428.
" adumbratum	427.	" assimilis	428.
Tettix scabrata	427.	" nigrofasciatus	428.
Locusta oculata	427.	Gryllotalpa gracilis	428.

[1] "Die Mysterien der europäischen Insectenwelt." Prof. Dr. Johannes Gistel. Kempten. 1856. 12mo, pp. 12 and 532.

[2] "A Synonymic Catalogue of Orthoptera." by W. F. Kirby. London, 8vo. vol. i.1904; vol. i. 1905; vol. iii. not yet published.

LIST OF RARER MOTHS TAKEN IN SHERBORN, MASS.

BY E. J. SMITH, NATICK, MASS.

Paonias astylus, June. A few each season.
Estymene prima, June, 2 ♂ 1 ♀.
Apantesis rectilinea, May–June–Aug.
" phyllira, middle to last of May.
" figurata, May, 8–14.
Charadra deridens, May–July.
Raphia frater, June, July.
Harrissimemna trisignata, July 17, one ♀.
Baileya doubledayi, July.
Hadenella numuscula, Sept. 11, 1 ♀.
Balsa labecula, May 18, one specimen.
Caradrina meralis, Sept. 15, one specimen.
Hadena didonea, July 7, one ♀.

This was identified by Prof. J. B. Smith who doubted the correctness of locality, as he had never heard of it from Mass., but there is no mistake in the matter. I took it at light.

Hadena leucoscelis, July 27, one.
Macronnoctua onusta, Sept.
Trachea delicata, July 7, one.
Homohadena badistriga, July 15, one.
Pachnobia monochromatea, May 24, June 25, both ♂s.
Porosagrotis tripars, Sept. 14, 1♂.
Euxoa bostoniensis, 1 ♀ bred. Date lost.
Mamestra rubefacta, June 14–18, 2♀.
Mamestra goodellii, June–Aug.
" anguina, June 1, 1♂.
" vicina, Sept.
Leucania extincta, June 14, July 1, 1♂–1 ♀.
Taeniocampa culea, June 1.
Xylina tepida, April 16, one sp. on Maple sap.
" baileyi, March, April, several both sexes on sap.
Tapinostola variana, July 20.
Fagitana littera, June, July.

Hydroecia u-album, May, June, Aug.
" speciosissima, Sept.
" rigida, Sept.
" impecuniosa, Sept.
Conservula anodonta, July 9, one.
Selicanis digitalis, Oct. 2, 6 specimens.
Derrima henrietta, July 31–Aug. 8.
Schinia spinosae, Aug.
" trifascia, July 24, one.
" nundina, Aug.
Autographa rogationis, one. Date lost.
" oxygramma, Sept. 24, one.
" ou, May 25, one.
" alias, Aug., one.
" epigaea, Aug. 28, one.
Paectes oculatrix, June 16–July 7.
Exyra rolandiana, July 10, one.
Melanomma auricinctaria, Aug.
Hormisa litophora, July, Aug., several.
" bivittata, July, several.
" orciferalis, June–Sept., several.
Dercetis vitrea, July.
Salia interpuncta, June, July, several.
Apatelodes angelica, July 12, 1 ♀.
Hyperaeschra georgica, June, several.
Odontosia elegans, July 11, one.
Janassa lignicolor, Aug.
Schizura apicalis, June 1, one.
Hyparpax aurora, June, several.
Cerura multiscripta, May 19. 1♀.
Fentonia marthesia, June 26, July 8. 1♂ 1 ♀.

Geometridae.

Dyspteris abortivaria, June–Aug., several.
Nyctobia fusifasciata, April 6, one.
Cladora atroliturata, April 21, one.
Lobophora montanata, May 8–31, several.

Euchoeca cretaceata, May 19–June 5.
Epirrita dilutata, Sept. 9, one.
Eustroma testata, Sept. 4–16.
Mesoleuca vasiliata, April 26–30, 1 pair.
Cosymbia albocostaliata, July 29, 1♂ 2♀.
Mr. Swett says this is the only record for the state as far as he knows.
Cinglis purata, Aug., several.
Orthofidonia exornata, June, one.
Sciagraphia continuata, May and Aug., several.
" mellistrigata, June 21, one.
Cymatophora brunneata, June–Aug., several.
Apaecasia deductaria, June 2, one.
Nacophora quernaria, June 14, 1 ♂.
Plagodis keutzingi, May, several.
" alcoolaria, June 2–10, 1♂–1♀.
" phlogosaria, July, several.
Gonodontis apiciaria, June, several.

A special meeting of the Entomological Society of America will be held in Boston about the 19th of August next, in connection with the Seventh International Congress of Zoology. Members are urged to be present and to contribute to the program of the meeting.

In order to facilitate the work of the Executive Committee in arranging a program, abstracts of proposed communications should be mailed to the Secretary,

J. CHESTER BRADLEY, Berkeley, California.
(After July 15th, Cornell University, Ithaca, N. Y.)

69 MOTHS TAKEN IN ONE HOUR — 41 SPECIES.

BY C. V. BLACKBURN, STONEHAM, MASS.

The following moths were actually taken in one hour (midnight) at 2 arc-lights, June 22, 1906.

Theretra tersa (rare)	1	Halisidota tesselaris	3
Ampelophaga chœrilus	3	Acronycta dactylina	1
" myron	2	Arsilonche albovenosa	2
Sphinx drupiferarum	2	Mesolomia iris	1
" gordius	1	Catocala nubilis	1
Lapara bombycoides	1	Homoptera edusa	1
Paonias myops	3	" cingulifera	1
Samia cecropia ♂	1	Hyperæschra georgica	1
Callosamia promethea ♀	1	Symmerista albifrons	3
Actias luna ♀	1	Ianassa lignicolor	1
Telea polyphemus ♂ ♀	2	Hyparpax aurora	1
Hyperchiria io ♀	1	Heliomata cycladata	1
Eacles imperialis ♂ ♀	3	Nacophora quernaria	1
Dryocampa rubicunda ♂	2	Gonodontis hypochraria	1
Haploa militaris	4	Lacosoma chiridota (rare)	2
Hyphantria cunea ♀	1	Euclea delphinii	1
Diacrisia virginica ♂ ♀	3	Prionoxystus robiniæ ♀	3
Isia isabella ♂ ♀	2	Sesia acerni	1
Apantesis phyllira ♂ ♀	4	Sthenopis argenteomaculatus	1
Euchætias oregonensis	1	micros (unidentified)	3

VANESSA MILBERTI IN BOSTON.— Thinking it might be of interest to the readers of PSYCHE, I write to say that in coming down Joy Street, Boston, April 18th, I saw a *Vanessa milberti*. This butterfly alighted so near to me that there could be no possible question of its identification.— JOHN LOWELL.

PROCEEDINGS OF THE CLUB.

The 263d meeting (also the Annual Meeting) of the Cambridge Entomological Club was held in the rooms of the Appalachian Mountain Club on Tuesday, January 15, 1907, at 7.45 P. M., with President Field in the chair and twelve members present.

Officers for 1907 were elected as follows: H. H. Newcomb, President; F. C. Bowditch, Treasurer; C. A. Frost, Secretary; A. C. Sampson and L. W. Swett, members at large of Executive Committee.

After the election of officers, the retiring President gave a very interesting address on the Mating of Saturniid Moths. The priority in emergence of the male imago was well illustrated by curves plotted from records of various species.

Mr. Frank A. Bates told of his observations on the Japanese moth, *Cnidocampa flavescens*, recently found abundantly in parts of Dorchester.

Meeting adjourned at the usual hour.

The 264th regular meeting was held in the rooms of the Appalachian Mountain Club on Tuesday, February 19, 1907, with President Newcomb in the chair and twelve members present. The President presented to the Club a gavel made from the stair-railing of Faneuil Hall, the wood being over two hundred years old....

A drawing of an abnormal spider, sent in by Mr. Emerton, was shown. The specimen was taken at Long Island, Portland, Maine, and was a female *Drassus saccatus* with one male palpus.

The topic announced for discussion, Rare Insects of Eastern Massachusetts, was next taken up by President Newcomb who exhibited specimens of *Pieris protodice*, *Lepisesia flavofasciata*, *Citheronia sepulcralis*, *Terias lisa*, and as his rarest capture, *Pamphila ocola*, a southern skipper not recorded north of southern Pennsylvania. He took this insect in Milton in a secluded meadow not accessible to traffic. Mr. Sampson remarked that he had taken seven specimens of *Terias lisa* in Sharon in one season.

Mr. Rogers exhibited *Paonias astylus*, *Conservula anodonta*, *Euthyatira pudens*, *Feralia jocosa*, *Homoptera benesignata*, *Plusia balluca*, *Zeuzera pyrina*, *Euptoieta claudia*, and a bred specimen of *Laertias philenor*, all from Medford, Mass. *Zeuzera pyrina* was also reported from Jamaica Plain and Dorchester by Mr. Low and Mr. Lucas respectively. Mr. Frost reported the capture of a male of the same species in Medford on July 1, 1903, at light.

Mr. E. J. Smith sent in a long list of rare Lepidoptera which he had captured in Natick.

Mr. Johnson showed a box of rare Diptera, most of them from the southern part of Mass.

Mr. Frost exhibited a specimen of *Cicindela purpurea*, variety *audubonii*, a black form not recorded, so far as he knew, from New England or the eastern part of the U. S. It was taken in October, 1904, at Framingham, Mass., and was the only one in about five hundred specimens taken during that year. He showed a green form of *purpurea* approaching the western variety *graminea*, and a specimen of *C. scutellaris*, variety *unicolor*, an immaculate aberration taken among a large number of the variety *rugifrons* at Framingham, Mass. He also showed a specimen of *Prionus pocularis* from the same locality, and one of *Stromatium pubescens* taken at light in Bedford, Mass., by L. W. Swett.

The 256th regular meeting was held at the usual place on Tuesday evening, March 19, 1907, with President Newcomb in the chair and nine members and one visitor present....

Mr. Johnson spoke of the summer meeting in Boston of the Entomological Society of America, and read a letter from Professor J. H. Comstock in regard to it. Suggestions for entertaining the Society were discussed by the members.

Mr. Field gave a very interesting talk on the subject of Experimental Entomology. He reviewed some of the recent literature of the subject, and exhibited a number of books. Mr. Field commented on the frequent use made of insects in the investigations of biologists, and the important contributions to entomology made by scientists who did not call themselves entomologists.

President Newcomb started a discussion of mimicry in insects, arguing that the oft-quoted mimicry of *Anosia plexippus* by *Limenitis archippus* is a fallacy. He had experimented by feeding plexippus to a golden robin and also to blue jays in captivity, and said that these birds had shown no hesitation about eating the insect. Several members expressed a doubt that the attacks of birds upon butterflies were sufficiently frequent to bring about such a case of mimicry.

Mr. Johnson exhibited a specimen of a wingless Tipulid, *Chionea valga* Harris, taken by Mr. Emerton on the snow at Jackson, N. H.[1]

Mr. Sampson spoke of the tenacity of life of lepidopterous larvae under certain conditions. He had recently sent eggs of *Hemileuca maia* to Arizona, and they had hatched soon after arrival. Then they were returned, and having no food for them he placed them in a cold room, where the last one died at the end of three weeks. He also told of a larva of *Automeris budleyi* that had lived five weeks after the last moult without any food, and died without pupating.

[1] See Psyche, XIV, p. 41, April, 1907.

Meeting adjourned at the usual time.

A special meeting of the Club was held at the usual place and time Thursday evening, March 28, 1907. President Newcomb was in the chair and there were eleven members and four visitors present.

Mr. H. H. Lyman of Montreal, the guest of the Club, read a paper on *Thecla calanus* and *I. edwardsii*. He held the two to be distinct and well marked species and gave the bibliography, synonymy, and description of the two species. The chief difference between them, he said, was in the extra mesial band of the under side of the secondaries. He exhibited a series of each species and pointed out the differences to the members.

Dr. Fernald, State Entomologist, from Amherst College, was unexpectedly the guest of the Club and addressed the meeting upon several subjects. He told of some pupa-grafting experiments which were performed under his direction by a Japanese student at the College. Nearly all the pupae so treated lived and the imagoes emerged, but in a crippled or undeveloped condition. Dr. Fernald also told of the capture of an abnormal *Papilio turnus* at Orono, Maine, many years ago. It had normal fore wings but no hind wings and its flight was very peculiar.

A discussion of freezing of insects, and freak forms, followed among the members.

Mr. Emerton exhibited some bottles of Neuroptera from Three mile Island, Lake Winnepesaukee, N. H., which were named by Prof. Needham.

Mr. Field spoke of his experiments on selection of color by pupating larvae of *Vanessa antiopa* and gave some results of his work.

Adjourned at 9:50.

C. A. FROST, *Secretary.*



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The Milton Home of Thaddeus William Harris.

THE HOME OF A FAMOUS ENTOMOLOGIST.[1]

Just south of Boston, in the suburban village of Milton, is the house in which Thaddeus William Harris lived during those fruitful years when he divided his time between the practice of medicine and the study of entomology. In this house he established his famous collection — in its day probably the best arranged in America — and wrote the first description of many important American insects. Here he accumulated volumes of accurate records of his observations, and made with his own hand long transcriptions from borrowed copies of books which he could not purchase. Though the classic "Treatise on Insects Injurious to Vegetation" was not written until after Dr. Harris's removal to Cambridge, it was during his residence in this house that much of the material for it was gathered.

The house has had an eventful history, and has been a familiar landmark to Bostonians for a hundred and thirty years. The attention of the passer-by is attracted to it by the fine old elms by which it is sheltered, and by a marble tablet setting forth the fact that it was here that the famous Suffolk Resolves were adopted, in 1774, by a meeting over which General Joseph Warren presided. No tablet tells of its having been the home of one of the pioneers of American Science; but residents of the village long cherished the memory of the kindly country doctor who for sixteen years lived and worked among them.

Dr. Harris has been aptly called "the Gilbert White of New England." To every naturalist the scene of his patient labors is historic ground.

W. L. W. F.

[1] Mr. F. A. Frizell of Boston has kindly permitted the use of the cut here presented.

TWO NEW MYRMECOPHILOUS HISTERIDAE.

BY H. C. FALL, PASADENA, CAL.

SOME two years ago I received from Prof. Cockerell a specimen of a minute Hetaerius taken by him at Boulder, Colorado, in the nest of a species of Lasius. Quite recently two more examples have been sent me by Prof. Cockerell, who expresses the hope that I may soon describe it, and remarking that he considers it "one of the sights of Boulder." It is indeed a very interesting and distinct little species, and I take pleasure in complying with the request of its discoverer. Advantage is taken of the opportunity to present also a description of a still more remarkable Histeride from California, for which it seems necessary to erect a new genus.

HETAERIUS MINIMUS n. sp.

Form of *brunnipennis* but smaller and of somewhat paler color. Head and entire upper surface somewhat sparsely, evenly, and very distinctly punctate, each puncture bearing a suberect fulvous hair. Head not obviously concave. Prothorax transverse, sides straight, convergent from the base to the oblique truncation of the anterior angles; lateral portions of the disk divided by a tranverse impression at basal third, the posterior portion more convex, the anterior nearly flat, neither of them appreciably more closely punctured and pubescent than the median area. Elytra a little wider than the prothorax, marginal stria complete, the three discal striae fine, subequal in length, each nearly attaining the elytral apex. Propygidium sparsely finely punctate at base, becoming smooth at apex; pygidium impunctate or nearly so. Prosternum flattened and margined at summit from base two-thirds of distance to apex, the marginal lines sinuate between the coxae, diverging a little in front of them, and then converging and uniting just behind the subapical transverse impression; apical concavity of prosternum nearly horizontal. Femora about two-fifths as wide as long. Length 1¼–1½ mm.

Boulder, Colorado.

Three specimens from nests of "Lasius sp." May 2, and "*Lasius americanus*" March 23.

This is much smaller than any other known species of the genus in our fauna, but as already stated comes nearest *brunnipennis*. This latter differs in addition to size, in its much more remote and less conspicuous punctuation and pubescence,

subapical approximate tubercles; pygidium closely punctured at base, becoming gradually nearly smooth at apex. Body beneath closely punctured in great part, the prosternum very densely so, the abdomen more sparsely. Femora very densely subscribrately punctate and sparsely pubescent. Tibiae more sparsely punctured.

Length 2¼ mm., width 1¾ mm.

Pasadena, California, Dec. 1, 1902. A single example taken from nest of unknown ant.

THE ENTOMOLOGICAL SOCIETY OF AMERICA.

PROGRAM OF THE SPECIAL MEETINGS TO BE HELD IN BOSTON DURING THE WEEK OF THE MEETINGS OF THE SEVENTH INTERNATIONAL ZOOLOGICAL CONGRESS.

Tuesday, August 20.

FIELD MEETING.— A special car will leave North Station at 2.15 P. M. for Saugus, where the insectary of the Gypsy Moth Commission will be visited. From Saugus special trolley cars will take the party through the badly infested region, giving an opportunity to see what is being done towards the extermination of the Gypsy Moth and the Brown Tail Moth.

Wednesday, August 21.

Meeting of the Executive Committee at 9 A. M., at the Harvard Medical School.

Thursday, August 22.

Meeting for the presentation of papers and for the transaction of business, 8 P. M., in the rooms of the Boston Society of Natural History. After this meeting a smoker will be given by the Cambridge Entomological Club.

THREE GALLS MADE BY CYCLORRHAPHOUS FLIES.

BY MILLETT T. THOMPSON, WORCESTER, MASS.

TRYPETIDAE.

IN Aldrich's "Catalogue of North American Diptera" eight species of the Trypetidae are recorded as gall-makers; viz., Trypeta baccharis Coquillett, T. notata Coquillett, Œdiaspis atra Loew, Œ. polita Loew, Aciura aplopappi Coquillett, Eutreta diana Osten-Sacken, Eurosta bigloviae Cockerell, and E. solidaginis Fitch. More complete knowledge of the life-histories of this family will undoubtedly increase the list. In each case the gall is formed on some Composite plant, three of the above species — Œdiaspis atra, Œ. polita and Eurosta solidaginis — attacking the genus Solidago. Material collected at Worcester Mass., during the past few months enables me to add *Eurosta reticulata* Snow, and *Eutreta sparsa* Wiedemann. Both make galls on the Golden-rod, and in this locality the galls have been found only on a large, smooth species, abundant in waste sandy fields, which I have not satisfactorily determined, perhaps Solidago juncea. But as these flies have a wide distribution, it is quite probable that other species also serve as the host-plant.



Figure 1, Gall of Eurosta reticulata.

Eurosta reticulata (Figure 1). The gall is a hollow cylinder, about two centimeters long by a half centimeter in diameter, evidently an aborted and transformed growing-shoot. The tip of the gall projects above the surface of the ground. Externally, traces of leaves appear in the form of imbricated scales, the uppermost of which may — particularly as the Spring advances — spread apart and show considerable

green color. Within is a large cavity, opening above between the closely appressed, scale-like leaves at the summit of the gall. The walls of the gall are moderately thick, fleshy, and firm.

I first discovered these galls in the latter part of April, but even at that date the pupal stage had been attained. The formation of the gall and the growth of the larva must take place during the previous Fall, while the shoot is still very imma-



Figure 2, Galls of Eutreta sparsa.

ture. In each gall the puparium lay in the upper part of the chamber. The flies emerged the last week in May and the first week in June. Many of the galls were parasitized by a large black Chalcis-fly.

Eutreta sparsa (Figure 2). While the gall of Eurosta reticulata projects above the surface of the ground, the gall of the present species is wholly underground. The injury here is likewise to the young shoots, but the gall is less specialized and



Figure 3, Gall of Agromyza magnicornis.

further growth of the shoot is not absolutely prevented. The gall indeed lies near the border-line between a true gall and such pseudo-galls as wood-inhabiting beetle larvae produce when boring in slender twigs. The larval chamber is small and irregular in form. Typically, the shoot swells and becomes a hollow, long-oval gall such as is shown in the figure. All forward growth of the shoot as a whole is stopped, but lateral reserve buds may grow and develop leaf rosettes. More rarely, only the proximal end of the shoot is affected, forming a short-oval or globular gall and the terminal bud develops normally. The long-oval galls usually measure 2 or 3 centimeters.

In April the gall of Eutreta sparsa was found to be of full size, but the contained larva was still small. The larva grew rapidly during May and pupated early in June. This stage lasted a little over two weeks, the flies emerging about the 20th of the month.

AGROMYZIDAE.

Agromyza magnicornis Loew. (Figure 3). When the leaves of the Blue Flag, Iris, are a few inches tall, the outermost leaf of the leaf-bundle is often found to be modified in so definite a manner that the resulting structure can be called a "gall." The leaf ceases to grow. The upper part broadens and also becomes thickened over a limited area, so that there is a very characteristic bulge on either side of the blade. If this be cut into,— even early in the Spring,— a small, oval, laterally compressed puparium is found. The flies emerge from these puparia about the last of May. This, I believe, is the first gall-like structure to be described for an Agromyzid, though the point of attack, the leaf, agrees well with the habits of other members of the Family, many of which mine the foliage of plants. As in the Trypetid galls already described it seems here that the larval life is completed during the previous Fall. But I have not as yet obtained data on this point.

The alteration of the outer leaf not infrequently injures the inner or second leaf of the leaf-bundle in a conspicuous way. The tip of the latter becomes caught in the malformed groove of the outer leaf and is held fast for a longer or shorter period. As a result the rapidly growing leaf is bent, and although it ultimately becomes free, yet the twisting produces a noticeable series of wavy folds.

I am indebted to Mr. C. W. Johnson of the Boston society of natural history for identification of the Trypetids and to Mr. D. W. Coquillett for that of the Agromyza.

CLARK UNIVERSITY, Worcester, Mass.

SOME NORTH AMERICAN SYRPHIDAE.

BY CHARLES W. JOHNSON, BOSTON, MASS.

PIPIZA FEMORALIS Loew, Centur., VI, 38.

THE species of the genus *Pipiza* as a whole, are quite difficult to determine. Dr. Williston's table, in his Synopsis of North American Syrphidae, would divide them readily into two groups — those with the "abdomen uniformly black," and those "with a basal interrupted yellow fascia." The type of *P. femoralis* Loew, consisting of a single specimen from Illinois, is characterized by having on the second segment, two large quadrate markings, very narrowly interrupted and formingaa broad fascia across the middle. On the other hand, these abdominal markings vary in size unttil they become obsolete or entirely wanting, in which case we have the *P. albipilosa* Williston.

A large series collected by the writer in the vicinity of Philadelphia, Pa. (the locality for the two types of *albipilosa*), shows that a large percentage have traces of, or quite prominent yellow markings on the second segment. The species was common at Arcola, Montgomery Co., Pa., April 27, 1894; later it was taken at Edge Hill, Pa., May 3, 1896; it was also collected by Mr. C. T. Greene at Lehigh Gap, Pa., July 1, 1903. Recently I have received from Mr. Germain Beaulieu, four specimens collected in Montreal, Canada, May 10 to 20, 1906, which show all gradations in the abdominal markings from the typical *femoralis*, to the more strongly marked specimens associated with *albipilosa*. Specimens of an intermediate character have also been received from Mr. S. A. Shaw, Hampton, N. H., May 17, 1904, and through Dr. W. E. Britton, collected by Mr. H. L. Viereck, at New Haven, Conn., May 7, 1905, and by Rev. H. W. Winkley at Branford, Conn., May 25, 1905. Mr. G. Chagnon, also collected it at Rigaud, Canada, May 28, 1899. I have collected the typical *albipilosa* at Auburndale, Mass., May 26, 1905.

There seems to be no structural character to separate the two; the dark tibial bands vary considerably in extent, being as a rule less prominent in the typical *femoralis*; the slight clouding on the middle of the wing is also variable; the whitish pile is noticeably longer on the male than on the female. Among the twenty specimens before me seven are females; four of these would be considered typical *femoralis* and three intermediate. Of the males four are typical *albipilosa* while eight are intermediate in character. The specimens vary from 7 to 9 mm. in length.

They have the habit of hovering in the air, in the woods, along the paths and roadways.

Pipiza radicum Walsh and Riley, is not related to this species, as is shown by Mr. D. W. Coquillett (Proc. Washington Entom. Soc., VI, p. 200, 1904).

Pipiza festiva Meigen.

P. festiva Meig. Syst. Beschr., III, p. 243, 1822; Williston, Syn. N. Amer. Syrphidae, p. 27, 1886.

Two female specimens which agree with the description of this species, were taken by the writer at the cascades on the road to Mt. Greylock, near North Adams, Mass., June 14, 1906. Comparing these with the specimen in the Museum of Comparative Zoology, from "Canada," referred to by Osten Sacken in his Catalogue as "*Pipiza festiva* Meigen (or a species closely allied to it)" proves them to be the same. There is also a specimen from Hallowell, Me., in the Harris collection, Boston Society of Natural History bearing the MS. name of "*binotata.*"

That it is a variable species is shown by Schiner in his Fauna Austriaca I, p. 262, where he considers the *P. ornata, lunata* and *artemis* only variations. In general appearance it resembles *P. femoralis* but is readily distinguished by the dark smoky brown of the outer half of the wing; it is also a little larger, measuring about 10 mm., while *femoralis* averages about 8 mm. The locality "Canada" being questioned by Dr. Williston probably accounts for its omission by Prof. Aldrich from his Catalogue. The species has recently been recorded from Roca, Nebr., by Mr. Paul R. Jones (Jour. N. Y. Entom. Soc. XV, p. 89, 1907).

Pipiza quadrimaculata Panzer.

Syrphus quadrimaculatus Panz., Fauna Germ., LXXXVI, p. 19, 1803.

Pipiza quadrimaculata Meigen, Syst. Beschr. III, p. 249, 1822; Schiner, Fauna Austr., I, p. 262, 1862.

On June 8, 1898, I collected a number of specimens referable to this European species on the flowers of the Labrador tea (*Ledum latifolium*) near Ricketts, "North Mt." Pa., alt. about 2300 ft. The same species was collected on Mt. Greylock, Mass., June 15, 1906, at an elevation of 3535 ft. The specimens agree so closely with the description of this species, that there seems to be no doubt of their identity. The head, thorax and abdomen are a very dark bluish black, shining, with short thin hair; antennae brown; second and third segments of the abdomen, each marked

with two yellow spots, those on the third being usually much smaller. Legs black, the knees and tarsi brownish, wings tinged with dark brown. Length 6–7 mm.

In the abdominal markings there is considerable variation. Among the eleven specimens collected the spots on the third segment show all gradations, from equal in size those on the second segment, to being obsolete and in one specimen wanting. The males have the most prominent markings.

PIPIZA AUSTRALIS n. sp.

Pipiza pulchella Johnson, Proc. acad. nat. sci. 1895, p. 329 (*non* Williston) ♂ ♀. Head, thorax and abdomen black or a very dark blue-black, shining, covered with a sparse whitish pile. Antennae brownish black, length of the third joint between four and five times its width, under side toward the base more or less reddish. Legs bluish black, tips of all the femora, basal half of the front and middle tibiae, the metatarsi and two following joints of the tarsi yellow; basal half of the posterior metatarsi and the two last joints of all the tarsi black. Wings dark brown, somewhat lighter towards the base, last section of the fourth longitudinal vein angulated in the middle. Length 6 mm.

Five specimens, St. Augustine, Florida, March 15, 1891. The length of the third antennal joint and venation induced me from the description, to refer it to *P. pulchella* in my paper on the Diptera of Florida. Since that time I have collected a number of the true *pulchella* and the distinctness of the two is very apparent. Its longer third antennal joint, dark brown wings and very dark blue-black body are the principal distinguishing features.

The genus is characteristic of the transition and boreal zones, this being the only species recorded from the lower austral.

CHRYSOTOXUM VENTRICOSUM Loew, Centur., V, 44, 1864.

Owing to a mistake in the habitat, there seems to be considerable confusion regarding this species. The two types are marked "W. T.," the original description gives "Washington." Osten Sacken, Catalogue, 1878, gives "Distr. Columbia," as does Dr. Williston in his Synopsis of the Syrphidae, p. 15 "District of Columbia (Lw.), Canada." The original description also calls for an inverted Y and not a V shaped marking on the fifth segment. It might be referred to either, it is really a very broad Y with a short stem. The scutellum of the types shows faintly the dark translucent disc so characteristic of all the species and cannot be called entirely yellow,

as Loew's description ("scutellum totum flavum") would indicate. When you try to make eastern species fit the description of *C. ventricosum* you have "troubles of your own." The *ventricosum* of the New Jersey list should therefore be *C. derivatum* Walk. I have seen no specimens of *ventricosum* from east of New Mexico and Colorado. It is certainly very close to the *C. arcuatum* Latr. of Europe.

CHRYSOTOXUM PUBESCENS Loew, Wien. Ent. Monatschr., IV, 84, 1860.

The types of this species are both from "Ill." Specimens agreeing in every respect with the types are frequently taken throughout the eastern United States from Maine to Virginia. The inverted V and Y which has been used in describing the markings on the fifth abdominal segment, is apt to lead to some confusion in separating the closely related species *C. pubescens* and *C. laterale*; the former calls for an inverted V, the latter an inverted Y. This distinction however is not as clear as it seems, as it varies in the two sexes, being usually more V shaped in the ♂ and Y shaped in the ♀. This variation has also been pointed out by Mr. C. H. Tyler Townsend (Trans. Amer. Entom. Soc., XXII, 35, 1895). The type (♂) of *C. laterale*, from "Nebr." is readily distinguished by having the third, fourth and fifth segments broadly, laterally margined with yellow. A specimen (♀) from the same state shows a very slight indication of the margin being interrupted. A similar specimen from New Jersey, I have also referred to *C. laterale*. In the twelve specimens before me there is an indication that *laterale* may possibly prove to be only an extreme variation of *pubescens*.

CHRYSOTOXUM DERIVATUM Walker, List III, 542, 1849.

The type of this species is from "St. Martins Fall, Albany River, Hudson Bay." We should therefore expect specimens from the same faunal area to be more typical than those from more southern localities. A specimen from Grand Lake, Newfoundland, collected by Mr. Owen Bryant agrees more closely with the description than any other; between this specimen however and a series from N. H., Mass., N. J., and Penna, it seems to be impossible to draw a line notwithstanding minor discrepancies. The Newfoundland specimen is about 9 mm. in length (Walker's description calls for 3½ lines), the basal two-thirds of all the femora are blackish and the markings on the fifth segment can be described as "three large yellow spots." All of these characters are however extremely variable; the eight specimens which I refer to this species vary from 9 to 11 mm.; the specimen selected by Loew from the English River, Can., as representing this species, has the basal half of the femora

black, while the two arcuate yellow spots on the fifth segment are narrowly connected with the central triangle. Two specimens from Mass. have only the basal third of the front and middle femora blackish, the basal half of the posterior femora being brownish; in one the brown forms a conspicuous middle band. A specimen from Franconia, N. H., collected by Mrs. A. T. Slosson has the posterior femora only slightly tinged with red towards the base; a similar specimen was collected at Folsom, Pa. Three specimens from Riverton, N. J., show only a slight basal tinge of brown on the front and middle femora.

CHRYSOTOXUM FASCIOLATUM Meigen. Syst. Beschr., III, 171, 1822.

In 1905 I received from Mr. H. H. Newcomb a large *Chrysotoxum* (♀), which he collected at Gold Rock (Rainy R. District), Ontario, July 21. While collecting on the summit of Mt. Greylock, Mass., July 15, 1906, alt. 3535 ft., I obtained after much difficulty, owing to their rapid flight and habit of poising in the air just out of reach of the net, a ♂ of the same species. Later I received from Mr. E. F. Hitchings two specimens collected at Hancock, Me., in June. That it was a species new to our fauna was readily apparent, but its determination was another matter; a new *Chrysotoxum* is not an inspiring thing, under existing conditions, and you feel like putting off the evil day.

An inspection of the Loew collection at the Museum of Comparative Zoology, through the kindness of Mr. Henshaw, revealed two specimens of this species, one marked "Mass.," the other "Can." and labeled "*fasciolatum*?". Lately I have received a specimen of this European species from Dr. F. Hermann, and find no character to separate the American specimens. Why was it not included by Loew and Osten Sacken in the Americana fauna? We can only account for it in this way,—Loew was describing only the new species. Osten Sacken may have overlooked it, or perhaps seeing the name questioned, thought it best to have its capture verified.

It is a conspicuous species measuring from 13–15 mm. in length, and readily distinguished by the wide black band extending entirely across the scutellum, leaving only a narrow basal and apical margin of yellow. None of the interrupted abdominal bands extend to the lateral margin, although in one specimen and in the one from Europe it is narrowly connected with the yellow at the posterior angle; the marking on the fifth segments might be described as a broad inverted Y. Basal half of the front and middle femora black, of the posterior femora brown.

MIXOGASTER BREVIVENTRIS Kahl.

M. breviventris Kahl, Kansas Univ. Quart., VI, p. 137, 1897.

A male and female of this interesting species were collected by Mr. Erich Daecke, at Lucaston, N. J., August 27, 1905. The type, a female, was described from Lawrence, Kans. The male differs but little from the female except that the fourth segment is nearly twice the length of the third, the posterior border on both being greatly dilated towards the lateral margins; the fifth segment and hypopygium (in the specimen before me) seem to be injured or forced within the abdomen, so that they cannot be accurately described.

TRICHOGRAMMA PRETIOSA RILEY: SEASONAL HISTORY.

BY A. A. GIRAULT, WASHINGTON, D. C.

THE paper here presented for publication is one of a series on this insect based on observations and studies made during the Cotton Bollworm Investigations in Texas in 1904, by the U. S. Department of Agriculture. The observations were made in the laboratory at Paris, latitude 33°, 45′ north and the host of the parasite was *Heliothis obsoleta* Fabricius, unless otherwise stated in the text. In their report on the bollworm, Quaintance and Brues (1905) have already given the substance of much that is to follow, but I believe the observations of enough importance to justify elaboration, an impossibility in connection with an economic report of that kind.

NUMBER OF GENERATIONS.

The species under consideration is a remarkable example of an hymenopterous insect having multiple generations, and to this fact may be largely attributed its efficiency as a parasite. From the beginning to the end of the breeding season of 1904, it was under constant observation, and in the laboratory many successive generations were bred, so that actual records were obtained for fifteen consecutive cycles from the latter part of May to the first week in November. In addition to this direct evidence, there was also obtained much supplementary data, which warrants a positive statement to the effect that there were at least eighteen distinct generations of the little egg-parasite in the vicinity of Paris in 1904. The records show that the parasites began to appear about May 3rd, corresponding to the first noticeable

appearance of the host eggs on corn, and they were present throughout the season in increasing numbers until about November 20th. To obviate further unnecessary discussion and for the sake of clearness and convenience, the generations are tabulated as follows:

Table I. Generations at Paris, Texas, 1904.

Generation No.	Eggs deposited.	Adults out.	Approximate length of cycle.	Sums of effective temperature.
1.	May 3	May 16	13 days.	324.1° *Fahr.*
2.	May 16	May 26	10 "	313.2
3.	May 26	June 6	11 "	354.7
4.	June 4	June 14	10 "	318.4
5.	June 14	June 22	8 "	297.2
6.	June 22	July 1	9 "	330.9
7.	July 1	July 9	8 "	298.9
8.	July 11	July 20	9 "	365.7
9.	July 20	July 28	8 "	300.
10.	July 29	August 6	8 "	298.7
11.	August 6	August 14	8 "	298.4
12.	August 14	August 23	9 "	364.0
13.	August 25	September 2	8 "	308.4
14.	September 2	September 11	9 "	308.
15.	September 11	September 20	9 "	314.2
16.	September 21	September 30	9 "	323.1
17.	October 1	October 14	13 "	408.1
18.	October 14	November 2	19 "	365.0
18a.	October 14	November 7	24 "	449.
18b.	October 14	November 8	25 "	465.
18c.	October 14	November 10	27 "	480.
Sums			254 days.	7285.0
Averages			12 days.	346.6° Fahr.

Length of Life Cycle.

By consulting table I, it is seen that the developmental period of a generation

varied considerably, from about 8 to 27 days, according to the season. Upon the approach of warm weather, it gradually decreased and remained practically constant from about the middle of June to about the middle of September, or during the warm summer months. In the fall, it rapidly increased in length, becoming twice as long in November as it was for the first generation in May, as would be expected from the fact that the mean daily effective temperature at that time of the year was very low. Table II is introduced to show as accurately as possible the lengths of the life cycles at different dates in 1904.

Table II. Lengths of the Life Cycle, Paris, Texas, 1904.

Lot No.	Dates.	Eggs deposited.	Adults out.	Approximate length of cycle.	
				Days.	Hours.
1.	May 3–May 16	May 3	May 16	13	
2.	May 26–June 6	P. M. May 26	Noon, June 6	10	21
3.	May 27–June 7	P. M. May 27	A. M. June 7	10	17
4.	June 1–June 12	A. M. June 1	A. M., June 12	10	17
5.	June 4–June 14	P. M., June 4	Noon, June 14	9	20
6.	June 14–June 22	A. M., June 14	A. M., June 22	7	22
7.	June 14–June 22	A. M., June 14	A. M., June 22	7	15
8.	June 20–June 28	A. M., June 20	P. M., June 28	8	6
9.	June 22–June 30	Noon, June 22	Noon, June 30	8	0
10.	June 22–July 1	P. M., June 22	A. M., July 1	8	14
11.	July 1–July 9	A. M., July 1	A. M., July 9	8	0
12.	July 20–July 28	P. M., July 20	A. M., July 28	7	19
13.	July 29–August 6	Noon, July 29	A. M., August 6	7	20
14.	Sept. 12–Sept. 20	P. M., Sept. 12	P. M., Sept. 20	8	0
15.	Sept. 21–Sept. 30	A. M., Sept. 21	A. M., Sept. 30	8	23
16.	Sept. 26–Oct. 4	A. M., Sept. 26	A. M., Oct. 4	8	6
17.	Sept. 28–Oct. 6	A. M., Sept. 28	P. M., Oct. 6	8	9
18.	Oct. 1–Oct. 14	Noon, Oct. 1	Noon, Oct. 14	13	0
19.	Oct. 14–Nov. 2	A. M., Oct. 14	A. M., Nov. 2	19	3
20.	Oct. 14–Nov. 7	A. M., Oct. 14	P. M., Nov. 7	24	6
21.	Oct. 14–Nov. 8	Oct. 14	Nov. 8	25	0
22.	Oct. 14–Nov. 10	P. M., Oct. 14	P. M., Nov. 10	27	0

The length of the life cycle was first recorded by Hubbard (Howard, 1892) in 1885 as being 7 days, the host being *Alabama argillacea* Hübner.

Hibernation.

Very little is known in regard to the mode of hibernation of many of the smaller parasitic hymenoptera, especially the more minute egg-parasites, and for this reason the following account will be of interest.

About two years before these observations were made, the method of hibernation of this species of Trichogramma was stated by W. A. Boucher whose account has not been accessible. However, Froggatt (1906) quotes Mr. Boucher as follows:— "....As the parasite remains dormant in the egg of the Codling Moth[1] during the winter and spring months, it is evident that the number of parasites that will again be present at the commencement of each fruit season to continue the destruction of the Codling Moth's eggs will depend upon the number of parasitized eggs that remain uninjured during the winter, the proportion of which, under ordinary circumstances, and without artificial assistance, will be very small;....."

Mr. Boucher apparently gives no evidence to show upon what his assertion is based and hence it needs confirmation. The following data obtained in the latter part of 1904 seems to indicate that his view is correct.

As shown in table II, the length of the life cycle increased rapidly in the fall from 8 days in late September to from 13 to 19 days in October, up to 27 days by the second week in November. In fact, the last or eighteenth generation varied unusually from 19 to 27 days, and the records show that this generation was a small or scattering one, the last principal generation being the seventeenth (adult about October 14). After about this date it is believed that hibernation commenced, though adults continued to be present, in rapidly decreasing numbers, for a month later (to November 19). In about the middle of October, and later, parasitized hosts in the field (including also *Alabama argillacea* Hübner) on corn and cotton were tagged and watched for emergence of the adults. Many of these were on dried and withered leaves when tagged, and when last examined after heavy killing frosts on November 20th, were found on these shriveled leaves, which were either hanging to the plants or were on the ground. Some of the parasitized hosts, however, had been washed from the leaves to the ground by the rain. The results are shown in the attached tables.

[1] *Carpocapsa pomonella* Linnaeus.

Table III. Hibernation Statistics, Oct. 11–20, 1904.

Host, Lot No.	No. hosts	Location.	Date tagged and known parasitized.	Hosts excluding parasites and date.	Hosts not excluding parasites by Nov. 20.	Total hibernating.	Condition when last examined (Nov. 20.)
1	2	Cotton leaves	October 11	2 — Oct. 19	0	0	
2	5	Dead corn leaves	12	0	5	5	Healthy.
3	3	Dead corn leaves	14	1 — Oct. 18	2	2	Healthy.
4	3	Cotton leaves	14	3 — Oct. 21	0	0	
5	4	Corn leaves	14	3 — Nov. 2–6	1	1	"
6	11	Corn leaves	14	11 — Nov. 2–15	0	0	
7	5	Corn leaves	14	5 — Nov. 7–10	0	0	
8	9	Corn leaves	17	8 — Oct. 20–Nov. 4	1	1	"
9	4	Young corn [1]	17	2 — Nov. 6	2	2	On ground; healthy.
10	3	Young corn [1]	19	0	3	3	On ground.
11	4	Corn	19	3 — Oct. 23–Nov. 4	1	1	Healthy.
Totals	53			38 — Oct. 18–Nov. 15	15	15 [2]	Foliage wilted and dead.

[1] Planted for experimental purposes.

[2] 28.3 per cent.

Table IV. Hibernation Statistics, Oct. 21–Nov. 3, 1904.

Host Lot No.	No. hosts.	Location.	Date tagged and known parasitized.	Hosts excluding parasites and date.	Hosts not excluding parasites by Nov. 20.	Total hibernating.	Condition when last examined (Nov. 20).
1	6	Cotton leaves	October 21	1 — Oct. 23	5	5	Healthy
2	8	"	22	1 — Nov. 15	7	7	6 healthy; 1 washed off.
3	12	"	22	10 — Oct. 29, Nov. 14	2	2	Healthy.
4	12	"	22	4 — Nov. 4–7	8	8	"
5	14	"	24	0	14	14	11 healthy; 3 washed off
6	14	Young corn [1]	24	1 — Nov. 6	13	13	Healthy; 7 on ground.
7	1	"	24	0	1	1	On ground
8	1	Cotton leaves	24	0	1	1	Healthy.
9	3	"	25	0	3	3	"
10	6	"	28	0	6	6	"
11	10	"	Nov. 1	2 — Nov. 16	8	8	"
12	1	"	3	0	1	1	"
Totals	88			19 — Oct. 23–Nov. 16	69	69 [2]	

[1] Planted for experimental purposes.

[2] 78.4 per cent.

Summary of Tables III and IV.

23	141			57	84	84	Healthy.

The tables serve to make clear the fact that at least as early as October 12th, hibernation had commenced, but that by October 20th only 28.3 percent were in that state, the remaining eventually emerging as adults. After October 20th, however, table IV shows that nearly 80 per cent of the parasites had not emerged up to the time of killing frosts (Nov. 20th and a few days earlier), or were hibernating. The data is not as conclusive as desirable, for it may be urged that the observations were not continued late enough to state definitely whether or not the adults issued after November 20th, and then hibernated. But as evidence against this, I offer the fact that adults failed to issue from 10 of these tagged hosts up to the middle of December, they having been carried to Washington, D. C., in vials and confined in the laboratory.

Another fact indicating hibernation as a larva in the host, is that no material increase in length of life could be noticed in the adults in the late part of October and in November. In reality, they seemed to perish more easily at that time than in the summer. During the observations, most of the adults issued during warm spells.

Increase in Numbers During a Season.

Assuming that the average number of eggs deposited by a female is 30, a conservative estimate, and that at least half of these will produce other females, the progeny of a single pair for such a season as 1904 in Texas would total to the unthinkable number of 3, 031, 721, 260, 073, 800, 781, 250, as shown in the accompanying table by generations.

Table V. Progeny of a Single Pair, by Generations.

Generation No.	No. of descendants.	Remarks.
1	30	Descendants of hibernating female.
2	450	
3	6750	
4	101, 250	
5	1, 518, 750	
6	22, 781, 250	
7	341, 718, 750	
8	5,125, 781, 250	
9	76, 886, 718, 750	
10	1, 153, 300, 781, 250	
11	17, 299, 511, 718, 750	
12	259, 492, 675, 781, 250	
13	3, 892, 390, 136, 718, 750	
14	59, 885, 852, 050, 781, 250	
15	898, 287, 780, 761, 718, 750	
16	13, 474, 316, 711, 425, 781, 250	
17	202, 114, 750, 671, 386, 718, 750	
18	3, 031, 721, 260, 073, 800, 781, 250	

All of this, of course, is purely speculation, for we have no means of actually obtaining vital statistics of this kind. No allowances have been made for mortality in the reproducing females, or in the young, and in order to make the calculation as conservative as possible, the totals should probably be halved, on the theory that but half of the female descendants in any one generation survive to reproduce. This would still leave us in a maze of unthinkable totals. The figures are merely introduced to show the possibilities in rapid reproduction present in this important egg-parasite, and no claim is made that they represent anything like actual fact.

LITERATURE REFERRED TO.

1892. Howard, Leland Ossian. Proc. U. S. Nat. Museum, Washington, XIV (1891), p. 577.

1905. Quaintance, Altus Lacy and Charles Thomas Brues. The Cotton Boll-worm. Bull. No. 50, Bureau Ent., U. S. Dep. Agric., Washington, p. 117.

1906. Froggatt, Walter. Agric. Gazette New South Wales, Sydney, XVII, pp. 390–391.

FOUR USEFUL BOOKS.

THE increasing and welcome differentiation between manuals for the identification of insects on the one hand, and text-books for the study of entomology on the other, has already led many an amateur entomologist to seek a better acquaintance with biological literature in general; and gaining it, to find new significance in the common phenomena of insect life which he has been studying. Entomologists are more and more coming to be biologists.

Dr. Folsom's "Entomology,"[1] published more than a year ago, is an admirable treatise on insect life in its biological aspects. To students remote from the larger libraries it brings a masterly summary of a widely scattered literature. Its chapter on Anatomy and Physiology is full of valuable ideas for teachers, to whom the quality of the illustrations must particularly commend the book. Its very fair-minded presentation of the vexed subject of Adaptive Coloration will abate the prejudices and perhaps improve the judgment of those who adventure upon this tempting ground. The treatment of the inter-relations of insects and plants is so good that one wishes it were much more extensive. The fifty-eight pages of bibliography at the end of the volume would alone entitle it to a place in every entomologist's library.

The book contains few errors. A very obvious one is in the statement of the approximate number of species of Coleoptera, on page 18.

Professor Metcalf's "Organic Evolution,"[2] now in its second edition, is a very useful synopsis of current evolutionary theory. It is interesting to note how largely entomology has contributed to the evidence here brought together, though we may perhaps demur a little at the space given to those time-honored but dubious examples of "terrifying attitudes" furnished by the Lepidoptera. The author's own faith in them is not declared, but the pictures give them undue prominence. On the whole, however, the book is well-balanced, and should save its readers from some of those hasty interpretations of observed phenomena to which beginners are so prone.

The experimental work of Fischer, Standfuss, Pictet, Cuénot, Gräfin von Linden, Poulton, Crampton and many other investigators is concisely summarized, with admirable illustrations, in Professor Morgan's "Experimental Zoology."[3] The

[1] Entomology, with special reference to its biological and economic aspects. By Justus Watson Folsom, Sc. D., Instructor in Entomology in the University of Illinois. Philadelphia: P. Blakiston's Son & Co.

[2] An Outline of the Theory of Organic Evolution, with a description of some of the phenomena which it explains. By Maynard M. Metcalf, Ph. D., Professor of Biology in the Woman's College of Baltimore. Second edition, revised. New York: The Macmillan Co.

[3] Experimental Zoology. By Thomas Hunt Morgan, Professor of Experimental Zoology in Columbia University. New York: The Macmillan Co.

necessarily brief chapters are supplemented by excellent bibliographies. Every beginner in entomology who embarks upon experiments to ascertain the effects of heat, light, and changes of food upon insects, or attempts the breeding of hybrids, will find this book indispensable. Not only will it tell him what others have done in the same line; it will also give him a broad idea of modern experimental research and its attained results, and awaken in him a new zeal for the investigation of nature.

For very practical service in enabling a novice to identify his captures or ascertain food-plants, Mr. Forbes's "Field Tables of Lepidoptera"[1] will be found of value. As now published in neat pamphlet form, these tables are an amplification of those given in Dr. Hodge's "Nature Study and Life." Though marred by serious typographical errors, and in places (as in the Glossary) by incompleteness of statement, the work exhibits many helpful features and much ingenuity of arrangement.

W. L. W. F.

[1]Field Tables of Lepidoptera. By William T. M. Forbes. Worcester, Mass.: For Sale by Davis & Bannister.



A FEW RARITIES

EXPLANATION OF PLATE II, WITH DESCRIPTION OF NEW VARIETY OF *LIMENITIS URSULA*.

BY H. H. NEWCOMB, BOSTON, MASS.

Fig. 1, *Thecla critola*, Hewitson, ♂, Patagonia Mts., Arizona. (E. J. Oslar.)

Fig. 2, *Lycaena pseudargiolus* var. *arizonensis*, Edw., hermaphrodite; left side ♂, right side ♀. Huachuca Mts., Arizona. (E. J. Oslar.)

Fig. 3, *Papilio polyxenes*, Fabr. ♂, aberrant; lacking the inner row of yellow spots across the primaries. Albany, N. Y. (J. H. Cook.)

Fig. 4, *Melitaea phaeton*, Dru., ♂, aberrant; having but one row of white spots across the wings and with the marginal lunules absent. Milton, Mass. (H. H. Newcomb.)

Fig. 5, *M. phaeton* var. *superba*, Strecker, ♂, (under side). Milton, Mass. (W. D. Denton.) I have another from the same locality on which the white is more diffused but less distinct.

Fig. 6, *Colias philodice* Godt. ♀ aberrant; the primaries being melanic. Sharon, Mass. (A. C. Sampson.)

Fig. 7, *Limenitis ursula* var. *albofasciata*, Newcomb, ♂. (Previously figured, uncolored, PSYCHE, Vol. XI, Pl. III.) Sharon, Mass. (A. C. Sampson.) See description on next page.

Fig. 8, same as above, ♀. Bedford, Mass. (L. W. Swett.)

Fig. 9, *Chrysophanus hypophlœus* Bdv. ♂ aberrant; left side normal, right side var. *fasciata* Streck. Sharon, Mass. (A. C. Sampson.)

Fig. 10, *C. hypophlaeas* var. *fasciata* ♀, albinic. Princeton, Mass. (L. W. Swett.)

Fig. 11, *C. hypophlaeas* var. *fasciata*, ♂, Wellesley, Mass. (H. H. Newcomb.)

Fig. 12, *Phyciodes tharos*, var. *packardii* Saund. ♂. Sharon, Mass. (A. C. Sampson.)

Fig. 13, *P. tharos*, Dru. ♀ albinic. I believe this example of albinism to be unique in this species. Dorchester, Mass. (H. H. Newcomb.)

Fig. 14, Limenitis sp. ♂. This butterfly which has been previously figured in Psyche (Vol. XI, Pl. 1, fig. 4) but uncolored, may be a cross between *archippus* Cram. and *ursula* Fabr. as suggested by Field (PSYCHE, Vol. XI, p. 1). There are certainly some grounds for this assumption: for instance the marginal row of white dots on the upper surface is distinctly traceable to *archippus*, while on the under side

the ferruginous basal patches are characteristic of *ursula*. Except for the latter I should unhesitatingly say it was a suffused form of *archippus*. Taken at Sherborn, Mass., by the late A. L. Babcock in 1895 and presented to me by A. P. Morse. There is in the Academy of Arts and Sciences, Brooklyn, N. Y., a similar specimen taken by Ernest Shoemaker at Washington, D. C.

All of the above diurnals are in my collection.

L., ursula var. *albofasciata* new. (Plate II, figs. 7 and 8). A dimorphic form of *ursula* having a mesial white band, of varying width, extending across all the wings from near the middle of the costa to the inner margin of the hind wings about one-third the distance from the anal angle and reappearing on the under surface. Outside the white band, on the upper side of the secondaries, there is a row of light blue spots sometimes merging into a continuous streak. These are replaced below by the usual ferruginous spots of *ursula*. There is very little, if any, red on the secondaries above as on the *arthemis* ♂.

Habitat, so far as reported, Mass., eastern N. Y., and vicinity of Jersey City.

Types, 2 ♂ ♂ and 2 ♀ ♀ in my collection.

Co-types 1♂ and 1♀, Museum of Comparative Zoology, Cambridge, Mass., and 1 ♀, collection of Henry Wormsbacher.

This variety is readily distinguishable from the species it closely resembles, *L. arthemis* Drury, by one familiar with both insects. On fresh specimens the ground color of the wings above in the basal area has a very different tone. On *ursula* and its varieties there is a bluish cast while on *arthemis* the same dark or nearly black region has a brownish hue. Other points to be considered are size, habitat, width and position of the white band, the amount and shade of the blue on the secondaries above and as before indicated the presence or absence of red on males.

Proserpina Edw. is generally conceded to be a variety of *arthemis* (a view which I take), although some writers have suggested that it might be a hybrid with *ursula*. The strongest argument to support this theory is the fact that the ranges of the two species overlap. No such claim can be made with regard to *albofasciata*, however, as it has been taken in localities where *arthemis* is unknown, such as Staten Island, Long Island, N. Y., and Jersey City. It has also been taken near Boston. Has *arthemis*? It seems very doubtful. All the recorded captures I have been able to trace have turned out to be *albofasciata*. There are several such specimens in the Museum of Comparative Zoology at Cambridge — one from Malden, another from Wollaston, etc., wrongly identified as *arthemis*. We must, then, revise our records.

If *albofasciata* is a sport we should expect to find intergrades; and we do find them in abundance, from those having the merest trace of a white band across the

fore wings to such examples as fig. 8. Fully 20 per cent. of the *ursulas* taken by me in eastern Massachusetts exhibit a tendency towards the development of this character.

It has been my privilege to examine a fine specimen of this variety, taken by Henry Wormsbacher near Jersey City, of which he writes as follows: — "The butterfly I captured has nothing to do with *arthemis*, but is a true *ursula*, more green in color like the form *viridis* and with broad white bands across the two wings. There are *no* markings whatever in the specimen which are found in *arthemis* and it is by all means a new variety. I do not think it necessary to make a sketch or photo of same, just take a greenish *ursula* ♀ and put white bands on it."

In view of the above facts and after several years of careful investigation, including the examination of scores of specimens, I am led to the positive conclusion that interbreeding of *ursula* and *arthemis* is in no way responsible for this variety.

THE NEWARK ENTOMOLOGICAL SOCIETY'S LOSS.

THE headquarters of the Newark Entomological Society on the fourth floor of the Newark Turn Hall was completely destroyed by fire in the early morning of June 3rd, 1907. The conflagration not only demolished the entire building but resulted in the loss of three lives.

The property of the Society consisted of a forty drawer cabinet containing one thousand specimens of Lepidoptera and two thousand five hundred specimens of Coleoptera, mostly representing local forms, besides a small collection in other orders; also a bookcase with one hundred and ten bound volumes and three hundred and sixty-five unbound volumes and pamphlets. All of this property was consumed by the flames except a few books that were in the hands of members. This collection was the accumulation of over twenty years of the Society's existence and as the loss is only partially covered by insurance it will be a long time before it can be replaced. Some of the books, perhaps, can never be obtained again.

The Society will be exceedingly grateful for any help in the way of rebuilding the library that may be given it. Entomologists are earnestly invited to send separates of their papers or other publications that they may have in duplicate for which the costs of transmission will be gladly refunded. Until the Society is again established in permanent quarters, parcels should be addressed to the secretary at New Brunswick, New Jersey.

JOHN A. GROSSBECK, *Sec'y.*

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—LXVIII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Caberodes confusaria Hübner. Dr. Packard reproduces a figure of Abbot's as the larva of this species (Mon. Geom., pl. xiii, fig. 18); but, as appears from the text, this is the larva of *floridaria* Guen., and in any case does not agree with that of *confusaria*, having humps, whereas that is smooth. Mr. Bruce mentions (Ent. Amer., iii, 47, 1887) that the larvae were swept from clover, but gives no description. The present is, therefore, the first account of the larva.

Egg. Subcylindrical, the micropylar end evenly truncate, the flat area nearly as large as the central diameter; other end rounded, the two diameters nearly equal; about 20 longitudinal ribs, even, sharp, white crested, stopping at the edge of the truncation, slightly beaded; cross-striae fine, obscure; micropylar disk coarsely reticulated at the edge, finer centrally. Bluish green, turning to dull red, the ribs and reticulations white. Size, .9 × .6 × .5 mm. Hatched in twelve days.

Stage I. Head rounded, black, slightly shining, epistoma white; width about .5 mm. Body moderate, rather stout, the feet normal. Dark vinous brown, banded with grayish white; two narrow bands on thorax, between the feet a little irregularly edged and confusedly mottled; five abdominal transverse bands, half as broad as the intervening spaces, situated anteriorly on joints 5 to 9, cut by a narrow, thread-like subdorsal line, which widens at its posterior junctions with the dark areas; the bands are narrowed ventrally and divided by a broad adventral and narrow medioventral lines. A trace of a dark dorsal line, cutting the white bands anteriorly on the segments. Joints 10 to 13 with narrow subdorsal and broad blotchy subventral white longitudinal lines. Feet dark, concolorous.

Stage II. Head quadrate rounded, slightly bilobed, wider than high; vinous black, epistoma, antennae and two vertical mottled lines over the lobes white; width, .7 mm. Body moderate, feet normal, situated well posteriorly, segments annulate. Dark vinous brown; a dorsal row of semi-elliptical white spots, each cut from the truncated end by a dark line, on joints 5 to 9; large mottled lateral blotches, partly cut by the subventral fold; slight white mottling subdorsally especially on the tubercles of joints 2–5 and 10–13; venter dotted on the tubercles. Thoracic feet black; anal feet large, dark, with a white outer line. Setae inconspicuous; no humps nor elevations. A medioventral white band cut by a longitudinal line and the annulet incisures.

Stage III. Head rounded quadrate, wide; vinous black, a broad mottled erect white band on the face of each lobe, divergent below; a white triangle in the clypeus; epistoma and bases of antennae white; width, 1 mm. Body robust, weakly annulate, colored as before; the dorsal and other white patches more mottled and cut by the ground color, which is darker, vinous blackish. Tubercles in the lateral patches lumpy white.

Stage IV. Head as before, black, epistoma white, white diffused dottings broadly over the angles of the lobes and slightly in the clypeus; rounded quadrate, as high as wide, antennae and mouth dark; width 1.4 mm. Body moderate, normal, uniform; vinous black, annulate; dotted white subdorsal line on joints 2–4, a cordate white mark, containing a dark dot in each lobe on joints 5–10, centered by tubercle i, the white cut by the annulet incisures, obscurely joined by a geminate dorsal band posteriorly; on joints 10–13 a waved broken subdorsal band, roughly imitating the cordate marks; a series of segmental white patches on joints 7–9, joined by a broad white band on joints 8–12, becoming a narrower band anteriorly and posteriorly, running narrowly onto the foot on joints 10 and 13. Venter obscurely white streaked, with a pale medio-ventral band, dark centered; small white dots laterally, especially at tubercles ii and iii. Orange blotches in the white lateral markings. With growth the markings fade and become yellowish, but leave a bright white lateral spot on joints 5, 6 and 7, largest on joint 7.

Stage V. Head rounded quadrate, thick, as high as joint 2, scarcely bilobed; dull black, with angular white dots over the sides and in clypeus, forming a short black-dotted band on the vertices of the lobes; epistoma white; width, 1.8 mm. Body robust, uniform, feet normal; leather brown (dead-leaf) dotted with black; a waved smoky black subdorsal line, the cordate white spots lost in the brown ground, leaving only a little white mottling about tubercle i, and whitish bars on the otherwise concolorous cervical shield and anal plate; faint linear white lateral line, black edged; large white spots about the spiracles on joints 5–10, faint posteriorly, involving tubercle iii by a lobe; an orange spot about tubercles iv and v. Venter with numerous indistinct lines of blackish and brown, subgranular, dotted by whitish. Thoracic feet dark; the abdominal ones of joint 10 white lined, of 13 large, marbled, with a whitish band anteriorly that joins a faint stigmatal band composed of the confluence of the stigmatal patches on joints 9–13; a reddish tinged stigmatal band on joints 2–4.

Stage VI. Head rounded quadrate, thick, the vertex roundedly divided, level with joint 2; colored as before but the white more extended, so that the ground color is white with crinkled and dotted dark brown marks, which are confluent over the sides and broadly each side of the median suture, and form a border within the

clypeus; eyes black, epistoma white, labrum brown, antennae white; setae short, brown, from small shining tubercles, normal; width, 2.4 mm. Body robust, cylindrical, uniform, tubercle i of joint 12 slightly enlarged, the thorax a little smaller, no humps. Coloration essentially as before; segments wrinkly annulate, smooth around the spiracles; carneous brown, olivaceous yellowish on the sides, shaded with blackish; thorax under lens pinkish white, dotted with brown-black, leaving subdorsal and stigmatal pale shaded bands, touched with ocherous; a square black patch laterally on joints 3 and 4; subventral region blackish shaded; feet dark brown. Abdomen dorsally (under lens) white, dotted thickly with ocherous and sparsely with black; a waved subdorsal black shade composed of dots and disappearing largely under a lens; sides olive shaded, a large white bilobed spot about tubercle iii and the spiracle, another on tubercle v and an ocherous one on tubercle iv, distinct on joint 6, fainter on joints 5 and 7, lost in a lilacine shade on joint 8 and running into a band on joints 9–13. Venter dotted, showing broad pale medio-ventral band, narrower dark one each side, narrow pale one, to a broader dark one over tubercles vi–vii, all rather evanescent under a lens; a straight subdorsal shade on joints 10–13, broken into oblique shades of dots; tubercle i of joint 12 white; anal shield and leg plates darkly marked on a white ground. Tubercles small, black; setae short, stiff, brown.

The larva spun a slight cocoon between leaves and pupated at once; adult issued in about four weeks.

Food plant, dandelion. The larvae were offered a variety of plants and chose this one. Probably they will eat a number of low plants. Larvae from Washington, D. C.

A LARGE number of European and American entomologists attended the summer meeting of the Entomological Society of America, held on August 22 in connection with the Seventh International Zoological Congress in Boston. The auditorium of the Boston Society of Natural History was well filled, and several very interesting papers were presented. Dr. Henry Skinner of Philadelphia presided. After the meeting the Cambridge Entomological Club entertained its guests at a smoker in the Grundmann Studios on Clarendon Street.

A REVIEW OF THE SPECIES OF THE GENUS BOMBYLIUS OF THE EASTERN UNITED STATES.

BY CHARLES W. JOHNSON, BOSTON, MASS.

SINCE making a study of the types of *Bombylius lancifer* O. S., in the Museum of Comparative Zoology, together with a comparison of the description of *B. mexicanus* Wied. and *philadelphicus* Macq., I find that there is a mistaken identification of two of our eastern species, and that the specimens referred to *B. lancifer* and *philadelphicus* in the New Jersey List, represent two undescribed species, while another undescribed form has been confounded with *fulvibasis* Macq. (= *atriceps* Loew).

Considering the apparently short duration of life of the adults of such readily recognized species as *B. major, pygmaeus, pulchellus* and *varius*, the time of appearance undoubtedly constitutes an important factor in determining closely related species. This feature requires a more careful study than I am now able to give, and while I have a large and carefully collected series, their relationship and time of appearance was not understood at the time they were collected. Owing to the fact that they are so easily denuded, specimens should be collected with the greatest care for denuded specimens are neither beautiful nor useful. Their life histories would also prove an interesting line of study. As far as known they are parasitic upon bees, chiefly *Andrena* and *Colletes*.

From the latitude of Philadelphia northward to Massachusetts the species can be divided provisionally into two groups:— those appearing in the spring, and those which appear in the summer; *B. major, pygmaeus, pulchellus* and *fulvibasis* representing the spring forms, and *B. mexicanus, incanus, fraudulentus, varius* and *subvarius* those of the summer. For *B. validus* I have no date of capture.

TABLE OF SPECIES.

1. Wings with the anterior half brown, which is sinuous and sharply defined posteriorly . . . . . *major* L.
   Wings with the basal portion brown and spotted with brown posteriorly . 2
   Wings with the basal portion brown, which is gradually evanescent posteriorly 3
2. Wings with the spots more or less coalescent and forming three quite distinct oblique cross-bands . . . . . *pulchellus* Loew.
   Wings with six or seven spots on the hyaline portion . . *pygmæus* Fab.

3. Pile grayish white . . . . . *incanus n.* sp.
   Pile yellowish 4
   Pile yellowish, the black hairs predominating on the abdomen . . . 5
4. Wings with the posterior portion strongly tinged with brown . . . 6
   Wings with the posterior portion grayish hyaline 7
5. Sternum with black pile, large species, 12 mm. . . . . *varius* Fab.
   Sternum with white pile, small species, 6–8 mm. . . . *subvarius* n. sp.
6. Proboscis nearly as long as the body, large species, 12 mm. . *validus* Loew.
   Proboscis only one-half the length of the body, small species, 5–8 mm. *fraudulentus* n. sp.
7. Third joint of the antennae long and narrowly lanceolate, large species, 10–12 mm. . . . . *mexicanus* Wied.
   Third joint of the antennae more broadly lanceolate, small species, 6–8 mm. *fulvibasis* Macq.

BOMBYLIUS MAJOR Linn.

This is the most common and widely distributed of any of the species. It is found from the Gulf of Mexico to Canada, from the Atlantic to the Pacific, and throughout Europe and Northern Asia to Japan. In Louisiana it makes its appearance in March, in Colorado in April. In the vicinity of Philadelphia it is found from April 9, to May 19, depending on the season. Waltham and Wellesley, Mass., May 6 to 9.

BOMBYLIUS PYGMAEUS Fabricius.

This species as a rule seems to be more northern in its distribution, although recorded from Virginia. I have not been able to obtain the species south of New Jersey, Jamesburg, May 4, and Passaic Co. May 14. In Massachusetts the species seems to be quite common at Auburndale (Riverside) May 7, and Waltham, May 30. It has also been taken by Mrs. A. T. Slosson at Franconia, N. H., and by Mr. G. Chagnon at Montreal.

BOMBYLIUS PULCHELLUS Loew.

A beautiful little species very common in the vicinity of Philadelphia, from April 29 to May 21, according to the season, but only remaining about a fortnight during any one year. I have a specimen from New York, collected by Mrs. Slosson, and have received specimens from Prof. C. H. Fernald, collected at Amherst, Mass., May 17 and 19.

Bombylius fulvibasis Macquart.

B. fulvibasis Macq. Dipt. Exot. V, 82, 1855.

B. atriceps Loew, Cent. IV, 49, 1863.

There seems to be no doubt that Macquart's name will have to be adopted for this species — "Long. 2¾, l. ♀. Trompe longue de deux lignes. Barbe blanche. Face d'un noir luisant. Front: le tiers antérieur d'un noir mat, à léger duvet fauve; les deux tiers postérieurs d'un noir luisant, à poils noirs." The size can only apply to this species and not to the specimen of "*philadelphicus*" which Baron Osten Sacken found with it — see O. S. Cat'l., note 159, p. 238.

This species which often closely resembles the following, is distinguished by its smaller size (6 to 8 mm.), duller yellow pile, with slight bands of black hairs on the abdomen, and the shorter and broader third antennal joint. Although widely distributed it seems to be quite local. I have only taken it at Clementon, N. J., where it can be obtained in great numbers on the flowers of the Sand Myrtle (*Leiophyllum buxifolium* Ell.), May 9–16. It has been collected by Mr. B. H. Walden at New Haven, Conn., May 25, by Dr. Geo. Dimmock, at Springfield, Mass., May 22 and by Mrs. Slosson at Charlotte Harbor, Fla.

Bombylius mexicanus Wiedemann.

B. philadelphicus Macq., Dipt. Exot. II, 1, p. 99, pl. VI, f. 3.

This is a larger species (10 to 11 mm.) than *fulvibasis*, with brighter and thicker yellow pile, black hairs rarely present, and a narrow lanceolate third antennal joint. It is usually found in the greatest number, about three weeks later than *fulvibasis*. It is represented in my collection by a specimen from Florida collected by Mrs. Slosson; Tifton, Ga., May 16 (G. R. Pilate); Ft. Washington, Md., May 26; Clementon, N. J., May 30; Riverton, N. J., June 9–16; Iona, N. J., June 8 (E. Daecke).

Bombylius incanus, n. sp.

B. philadelphicus Johnson, in Smith's Cat'l. N. J. Insects, p. 649 (not of Macquart).

♂. Face and front covered with dense silvery white hair, vertical triangle black, with black hairs, antennae black, the third joint narrowly lanceolate, proboscis about 3 mm. in length. Thorax grayish black, with white pile, the pile on the dorsum and scutellum less abundant and interspersed with black. Abdomen covered with long dense white pile, with a slight tuft of black hairs on the sides. A specimen

from Provincetown, Mass., has two tufts on each side, the anterior one being more prominent and giving the appearance of a transverse band, although no black hairs are present on the dorsal portion. Legs yellow, coxae, bases of the femora, knees and tips of the tarsi dark brown. Wings with the anterior basal third, dark brown, varying somewhat in extent and intensity. The specimens from Groton, Mass., are noticeably darker near the veins, the posterior portion of the wing hyaline, with a slight grayish tinge. Length, 5–7 mm.

♀. Front grayish above the antennae, and with short silvery white hairs, upper part and vertex grayish pollinose with black hairs. The abdomen has two distinct bands of black hairs, the hairs procumbent, the brown area of the wings less profused and hardly extending beyond the middle of the first basal cell, in other respects resembling the ♂.

The records for this species are at present confined to two states. In New Jersey it was first taken by the writer at Jamesburg, July 4, 1893, on May 30, 1897, a single specimen was collected at Clementon, and on June 13 of the same year a number were taken at Atco. Since then (June 8, 1902) it has been collected by Mr. E. Daecke at Iona and by Dr. P. P. Calvert, at Albion, June 1. The first specimens from Massachusetts to come under my observation were two, badly rubbed, from West Chop, Martha's Vineyard, collected by Mr. Albert P. Morse July 4, 1893. On June 24–27, 1904, I collected a number of specimens at Provincetown, and at Groton, July 8, 1905. There is a rubbed specimen in the Loew collection of this species marked "sp. nova inad."

This interesting species I have always found under similar conditions, *i. e.*, hovering over or alighting on the gray white sand of an old roadway, the color of the sand and fly being very similar. It resembles *B. metopium* O. S. from California, but lacks the brown strip of hairs extending from the shoulders to the base of the wings and also the black femora of that species. Types (♂ ♀) from Provincetown are in the New England collection of the Boston Society of Natural History.

Bombylius subvarius n. sp.

B. lancifer Johnson. In Smith's Cat'l. N. J. Ins. p. 649, 1890 (not of Osten Sacken).

♂. Face reddish brown, shining, sparsely covered with long black hairs; frontal triangle covered with a brownish pollen and bearing long black hair; inferior orbits and cheeks white, with long silvery, white hairs; antennae brownish black, the third joint very narrowly lanceolate; proboscis 6 mm. in length. Thorax black, opaque, covered with a long erect dull yellowish pile, which is mixed with black on

the post-alar callus and scutellum; lower part of the pleurae and sternum with white pile. Abdomen, base yellowish pilose with black predominating on the second and third segments, forming two broad bands, the black pile also predominating on the last segment; basal half of the venter white pilose, the remainder more or less blackish. Legs yellow, coxae black, knees and outer portion of the tarsi brown. Wings with the dark brown basal area quite clearly defined, extending into the discal and the first and third submarginal cells, the remainder of the wing grayish hyaline.

♀ Front covered with procumbent golden yellow tomentum and long black hairs (in denuded specimens shining black). The thorax, scutellum and abdomen beneath the thin yellowish and black pile, are covered with a procumbent golden tomentum, the white pile of the pleurae extending upward and forming a tuft in front of the wings. There are also tufts of white hairs on the sides of the first and fourth segments of the abdomen. Length, 7-8 mm.

Three specimens collected by the writer on the flowers of the New Jersey tea (*Ceanothus americanus*) at Morris Plains, N. J., June 25, 1892. Two specimens collected by Mr. H. L. Viereck at Lehigh Gap, Pa., June 26 and 29, 1901.

From the description, the ♂ of this species was inadvertently referred to *B. lancifer*. Its is however smaller and less robust, lacks the line of brown pile extending from the humeri to the wings, has narrower third antennal joints and a shorter proboscis. The male of this species resembles that of *varius* in miniature, but the pile of the sternum is white and not black, as in that species.

Bombylius varius Fabr.

This large and handsome species has been taken by the writer at the following localities: Glymont, Md., May 25, '96; Morton, Pa., July 7, '93; Westville and Riverton, N. J., June 15 to July 2. It was common at the latter place on the flowers of the "Red Osier" (*Cornus sericea*).

Bombylius fraudulentus n. sp.

♂. Face and front brownish black, opaque, with long black hairs, oral margin reddish, cheeks whitish with silvery white hairs; antenna black and narrowly lanceolate, proboscis about one half the length of the body. Thorax with long dense yellow pile, lower portion of the pleurae and sternum with white pile. Abdomen with yellow pile interspersed with black along the posterior margins of the third and fourth segments, forming more or less prominent bands; pile on the venter white. Legs yellow, extreme base of the femora, knees and terminal joints of the tarsi brown,

coxae black. Wings a dark yellowish brown at the base, extending in a somewhat lighter brownish shade over the entire wing, which is narrow and gradually tapering towards the apex.

♀. Front slightly covered with a golden yellow tomentum, easily denuded, leaving the upper part a polished black. On the abdomen the long hairs are less prominent, and the entire surface is covered by a yellow tomentum, a dorsal line and spots of whitish tomentum on the sides of the third and fourth segments being sometimes quite prominent. Length, 5–8 mm.

This species has been collected at the following places in New Jersey:— Iona, June 2, '02, (*Daecke*); Atco, June 18, '93; Jamesburg, July 4, '94; Orange Mts., July 4, '96; Morris Plains, June 24, '92 and Dover, June 25, '92 (*Johnson*). In Connecticut, at New Haven, June 27 (*E. J. S. Moore*) and in Massachusetts at Springfield, July 2 and 10, '99; Mt. Tom, June 26, '00, and July 14, '05 (*Dimmock*); West Chop, July 4, '93 (*A. P. Morse*), Provincetown, June 27 and Hyannis Port, July 3, '04 (*Johnson*). In the list of New Jersey Diptera, this species was confounded with *subvarius* (*lancifer*). It can however be readily distinguished from both *subvarius* and *fulvibasis* by its dark evenly clouded wings, which are noticeably narrower and more gradually tapering, especially in the male, and also by the shorter proboscis. It appears in greater numbers at least a month later, than *fulvibasis*.

The types, (♂ Provincetown and ♀ Hyannis Port) are in the New England collection of the Boston Society of Natural History.

Bombylius validus Loew.

This large species I have not been able to obtain on any of my collecting trips, and there seems to be no date bearing on its time of appearance. It is widely distributed, being recorded from "Ga., Va., Ill., N. Y., and Montreal." I have a specimen marked "Tex.," (*Bolter*). It is readily distinguished by its noticeably long bright yellow pile and long proboscis. The dark brown of the wings extends in a slightly lighter shade over the entire surface.

THE SPHECODIDAE OF SOUTHERN MAINE.

BY J. H. LOVELL AND T. D. A. COCKERELL.

THE genus *Sphecodes* is represented in this locality by eight species, which have been collected chiefly in July and August. They visit a variety of flowers with easily accessible nectar, but the males have been found most commonly upon the inflorescence of Solidago. The species are very variable in coloration, sculpture and the venation of the wings. All of the species described in this paper have the mandibles bidentate. The Maine species may be separated by means of the following key:

FEMALES.

Mandibles black at base, rufous or rufescent at apices, size larger, over 6 mm. . 1.
Mandibles mainly red or yellowish-red, the apices darker, size smaller, less than 6 mm. . . . . 2.

1. Abdomen wholly red, or segment 5 black, 9–10 mm. . . *dichrous* Sm. and *lautus*, *persimilis*, *obscurans* n. spp.
   Abdomen with segments 4–5 black, 6½–8 mm. . . . *prosphorus* n. sp.
2. Enclosure of metathorax reticulated, smaller . . . *mandibularis*.
   Enclosure with parallel rugae, larger . . . . . *levis* n. sp.

MALES.

Wholly black, joint 4 = 2 + 3 . . . . . 1.
Black and yellow or red, joint 4 nearly equals 3, small species . . . 2.

1. Larger, 8–9 mm. . . . . *dichrous*.
   Smaller, 6 mm. . . . . *prosphorus* n. sp.
2. Wings milky white . . . . . *nephelotus* n. sp.
   Wings dusky . . . . . 3.
3. Enclosure reticulated, mandibles reddish-yellow, with darker red apex, *mandibularis*.
   Enclosure with parallel rugae, mandibles dark with red apex . . *levis* n. sp.

There occur at Waldoboro a small group of bees consisting of *S. dichrous* and a number of closely allied varieties or species, three of which have been named and described in this paper. The precise status of these bees must for the present remain uncertain, as owing to their rarity only one or a few specimens of each kind have been collected; and also because all of the males obtained belong to a single species. Care is necessary lest the table of differential characters prove misleading, since mention of like characters is largely omitted; and unlike characters, which often

require careful attention to be noted, are here readily perceived. In general appearance these bees bear a close resemblance, and their exact relationship can only be determined by a large series of specimens and much additional field study.

Entirely apart from the question of their validity as species the variations presented by these bees in the color of the wings, the color and punctuation of the abdomen, and in several minor particulars are of so much interest that they are worthy of description. They may be separated as follows·

Wings dusky, abdomen light red, segments 2–4 punctured all over. . *lautus* n. sp.
Wings reddish, abdomen darker 1

1. Segments 1 and 2 impunctate, or with a few minute punctures, clypeus densely and confluently punctured . . . . . *persimilis* n. sp.
   Segment 1 impunctate, segments 2–4 finely punctured on basal third, seg. 4 largely, seg. 5 entirely black . . . . . *obscurans* n. sp.
   Segment 1 distinctly punctured, segments 2–4 with distinct punctures except on apical margins, sometimes a discal spot on segment 1 . . *dichrous* Sm.

SPHECODES DICHROUS Sm.

1853 *Sphecodes dichroa* Sm. ♀ (not ♂), Cat. Hym. Brit. Mus. 1: 38.

♀.— Length 8 mm. Head and thorax black, abdomen red, a black discal spot on segment 1, the 5th segment black. Face clothed with white hair, punctures on clypeus coarse and remote, front with large deep punctures. Mesothorax shining, with large widely separated punctures. Wings reddish, but less so than in *obscurans* or *persimilis*; tegulae dark, probably variable in color. Metathorax not strongly reticulated, the ridges chiefly longitudinal. Abdomen distinctly but not closely punctured, segment 1 with sparse, well-defined punctures; following segments with distinct punctures except on apical margins.

Taken on Crataegus coccinea, June 14. Another specimen collected on Cornus alternifolia, the last of June, is referred to this species, with which it agrees in most characters; but the discal spot on the first segment is wanting, or very obscure; and the area of the metathorax is more strongly reticulated.

♂.— Eight black males taken on Solidago, August 9, 11, and 17, are temporarily referred to *S. dichrous*. They vary in length from 7–8 mm., and some specimens are broader and more robust than others. The face and sometimes the clypeus is covered with white hair. The mesothorax is coarsely, but not densely punctured, except in front; the metathorax is shining, with short salient ridges, giving it an irregular pitted appearance. The wings vary from nearly hyaline, to hyaline with the apical

margin distinctly clouded with red. The abdomen is very finely and rather sparsely punctured all over.

SPHECODES LAUTUS n. sp.

♀.— Length just over 9 mm. Head and thorax black; abdomen red, of a rather light tint, long and nearly parallel-sided, with the apical segment black. Wings hyaline basally, the apical half strongly smoky, with a dilute blackish, but not at all reddish or yellowish tint. Face covered with white hair. Mesothorax sparsely punctured, shining; area of metathorax strongly, irregularly ridged with no well-defined margin. Abdomen finely punctured, sparsely on basal segment, 2nd and following segments punctured all over.

One specimen on Spiraea salicifolia, August 4.

SPHECODES PERSIMILIS n. sp.

♀.— Length 9–10 mm. Head and thorax black; abdomen red of a bright chestnut tint, of normal shape, apical segment red. Wings very strongly reddened. Face with much white hair. Mesothorax densely and coarsely punctured; area of metathorax irregularly subcancellate. Abdominal segments 1 and 2 nearly impunctate, or with a few scattered punctures, basal part of apical segments with small punctures.

Two specimens on Umbelliferous flowers, July 14 and 19.

SPHECODES OBSCURANS n. sp.

♀.— Length about 8½ mm. Head and thorax black; abdomen dark red, the apical segment black, and the penultimate suffused with blackish. Wings very strongly reddish. Face with little hair. Mesothorax dull (probably due to moisture in cyanide jar), with sparse rather weak punctures; area of metathorax strongly reticulated, not well-defined. First segment impunctate, segments 2–4 with minute punctures only on the basal third.

One specimen on Aralia hispida, which blooms here in July. Two other specimens, also taken on Aralia hispida, July 7 and 16, resemble *S. obscurans*, but differ in several particulars.

In Can. Ent. 36: 232, 1904, there are described from Washington State a similar group of bees closely allied to *S. dichrous*, one of which (*S. arvensiformis* Ckll.) it is noteworthy has the wings dark and very yellow. A comparison of the differential characters of the four Maine species is as follows:

Character.	*S. dichrous* Sm.	*S. obscurans* n. sp.	*S. lautus* n. sp.	*S. persimilis* n. sp.
Head. Front.	Punctures large and deep with the shining intervals plainly visible.	Punctures very close and quite small, but very distinct. Short transverse head.	Punctures large.	Coarsely punctured, dull.
Eyes.	Black.	Paler.	Intense black.	Apparently brown in life, convex below.
Clypeus	Coarsely punctured.	Large punctures widely separated in the middle, a median sulcus.	Large punctures.	Densely and confluently punctured.
Wings	Reddened, but less so than in *obscurans* and *persimilis*.	Strongly reddish.	Dusky hyaline.	Strongly reddish.
Tegulae.	Dark.	Lighter.	Dark.	Lighter.
Mesothorax.	Shining, with widely separated punctures.	Dull, with sparse weak punctures.	Shining, sparsely punctured.	Densely and coarsely punctured.
Area of metathorax.	Ridges chiefly longitudinal, with a few cross ones.	Strongly reticulated, margin not well-defined.	Strongly, irregularly ridged, margin poorly defined.	Irregularly ridged.
Punctuation of abdomen.	Distinctly but not closely punctured 1st segment sparsely segs. 2–4 except on apical margins.	Segment 1 impunctate, segs. 2–4 with minute punctures on basal third.	Finely punctured segment 1 sparsely, segs. 2–4 all over.	Segments 1 and 2 nearly impunctate, segs. 3–4 with small punctures at base.

SPHECODES PROSPHORUS n. sp.

♀.— Length 8 mm. Head and thorax black; abdominal segments 1–3 dark red, very shiny, the apical segments black, or the fourth partly reddish. Face thinly clothed with white pubescence; densely and finely punctuated above the antennae and on the vertex; mandibles bidentate, black at base with dark red apices. Mesothorax smooth and shining, with sparse distinct punctures, the median sulcus evident. Wings dusky hyaline, with a distinct brown tint, stigma and nervures dark rufo-fuscous, tegulae rufo-fuscous. Enclosure of metathorax well-defined

with a salient rim, shining, coarsely reticulated, the reticulations irregular in form but about the same size. Segment 1 with a few small scattered punctures; segments 2–3 with numerous fine punctures at base, the apical margins depressed, smooth and shining; segments 1–3 dark red; apical segments black; segment 3 in some specimens partly clouded with black.

♂.— Length 6 mm. Entirely black, resembles the male of *S. dichrous*, but is smaller with finer punctures; the apical margins of the abdominal segments are depressed, impunctate, and obscurely testaceous. One male taken on Solidago, Aug. 9, has only two submarginal cells.

The female was taken on Crataegus coccinea, June 14; the male on Aralia hispida, July 30; and Solidago Aug. 17. This species is allied to *S. dichrous*, but typical specimens may be easily separated by the smaller size of both sexes. It is a neater, more shining species with finer sculpturing, and in the female the abdomen is more largely clouded with black. A female from Spiraea salicifolia, July 30, is smaller and duller, the red of the abdomen lighter, with the black apex better defined, and the wings not so brown. It may represent a distinct species, but more material is necessary to decide this question. Compared with the various Rocky Mountain and Pacific Coast species, *S. prosphorus* is not much like any of them, but it has a very close resemblance to the European *S. gibbus*. The male of *gibbus*, however, usually has the abdomen red, except at base and apex.

SPHECODES LEVIS n. sp.

♀.— Length about 5 mm. Head and thorax black; abdomen red with black apical segments; mandibles lively red with the base black, bidentate, the inner tooth small; antennae black, the flagellum faintly reddened beneath. Mesothorax shining, with rather large well separated punctures, the median sulcus distinct but shallow; wings dusky hyaline with dark brown nervures and stigma, tegulae testaceous in front; area of metathorax well-defined, semicircular with parallel longitudinal rugae, but not reticulated, though there are indications of cross lines, giving the rugae a sort of beaded appearance. Abdomen impunctate, segments 1–2 red, segment 3 suffused with blackish, apical segments black.

♂.— Length about 5½ mm. Head and thorax black; abdominal segment 1 black with apical margin yellowish-red; 2nd segment yellowish-red at base, sides and apex, center black; apical segments black. Breadth of head about equal to the length; mandibles black, rufous at tips; antennae black, joint 4 nearly equals 3. Mesothorax shining, rather coarsely punctured: semicircular enclosure of metathorax well-defined with parallel rugae. Wings a light shade of fuscous, stigma and nervures brown, tegulae black.

One female on Cornus canadensis late in June, male on Solidago bicolor. Readily separated from other Maine bees by the parallel longitudinal rugae of the metathorax.

SPHECODES MANDIBULARIS Cr.

1872 *Sphecodes mandibularis* Cr. ♀, Trans. Am. Ent. Soc. 4: 250.
1897 *Sphecodes mandibularis* Robt. ♀ ♂, Trans. Ac. Sci. St. Louis, 7: 317.
1903 *Sphecodium cressonii* Robt. ♀ ♂, Ent. News, 14: 106.

Two females collected on Solidago, July 27 and Aug. 7; the male on Solidago juncea, Aug. 7; Carduus arvensis, Aug. 6; and on Solidago, July 30 to Aug. 25. Of twelve specimens of the male all have the abdomen largely red. One male has the first transverse cubital nervure wanting in one wing and obsolescent in the other.

(The type of *S. mandibularis* Cr. is no longer in existence, but there is a cotype which Mr. Cresson regards as in all respects typical. The cotype, Mr. Viereck informs me, has the mandibles bidentate.— J. H. L.)

SPHECODES NEPHELOTUS n. sp.

♂.— Length 5 mm. Head and thorax black; abdomen largely red, but the apical margins of segments 1–3 are broadly reddish-yellow; on segment 2 the black is often reduced to a narrow, median strip, the base of segment 2 may also be yellow; segment 1 has the base always broadly black. Face clothed with dense, white hair; scape black, flagellum testaceous beneath, blackish above, joint 4 nearly equals 3; mandibles red, dark only at extreme base. Mesothorax shining, with fine, sparse punctures; wings milky-white, nervures and stigma pale brownish; tegulae testaceous; enclosure of metathorax well-defined, obscurely reticulated, the rugae tending to become parallel.

Fourteen males collected on Carduus arvensis, Aug. 6; Solidago juncea, Aug. 3–7; and Solidago, Aug. 17. Easily distinguished by the milky-white wings.

SPHECODES GALERUS n. sp.

♀.— Length 6½ mm. Head and thorax black; abdomen broad, first two segments and base of third dark red, apical segments black. Mandibles dark rufous apically; flagellum dull brown beneath; mesothorax coarsely and closely punctate, opaque; area of metathorax shining, strongly reticulated, with a prominent rim. Wings dusky hyaline, with a brownish tint, nervures and stigma very dark, second submarginal cell narrow, much contracted above.

One specimen from Hampton, New Hampshire, collected by S. A. Shaw, Sept. 9, 1905. Readily known from *S. prosphorus* by its smaller size and much more densely punctured mesothorax. In Robertson's table it runs to *S. clematidis*, but the mesothorax is not at all "strongly sulcate," the abdomen is different, and the nervures and stigma are much darker. The coarse, close punctures of the mesothorax, and the color of the mandibles readily separate it from *S. levis*. The larger size alone separates it at a glance from *S. mandibularis*.

THE NORTH AMERICAN SPECIES OF SPHECODES.

America North of Mexico.

SPHECODES ANTENNARIAE Robt.

1891 *Sphecodes antennariae* Robt. ♀, Trans. Am. Ent. Soc. 18: 63.
1903 *Dialonia antennariae* Robt. ♀ ♂, Ent. News, 14: 105.

SPHECODES ARROYANUS Ckll.

1904 *Sphecodes arroyanus* Ckll. ♀, Ent. 37: 231.

SPHECODES ARVENSIS Patton.

1880 *Sphecodes arvensis* Patton, ♀ ♂, Am. Ent. 3: 230.
1897 *Sphecodes dichrous* Robt. ♀ ♂, Trans. Ac. Sci. St. Louis, 7: 316.
1903 *Sphecodes arvensis* Robt. ♀ ♂, Ent. News, 14: 106.

SPHECODES ASCLEPIADIS Ckll.

1898 *Sphecodes asclepiadis* Ckll. ♀, Bull. Denison Univ. 11: 45.

SPHECODES ARVENSIFORMIS Ckll.

1904 *Sphecodes arvensiformis* Ckll. ♀, Can. Ent. 36: 233.

SPHECODES CLEMATIDIS Robt.

1897 *Sphecodes clematidis* Robt. ♀ ♂, Trans. Ac. Sci. St. Louis, 7: 320.

SPHECODES COLUMBIAE Ckll.

1906 *Sphecodes columbiae* Ckll. ♀, Can. Ent. 38: 280.

SPHECODES CONFERTUS Say.

1837 *Sphecodes confertus* Say, ♀, Bost. Journ. Nat. Hist. 1: 392.
1859 *Sphecodes confertus* Lec. ed. Say's Writ. 2: 771.
1865 *Sphecodes confertus* Sichel, ♀, Ann. Soc. Ent. Fr. 5: 454.
1880 *Sphecodes falcifer* Patton, ♀ ♂, Am. Ent. 3: 230.
1897 *Sphecodes confertus* Robt. ♀, Trans. Ac. Sci. St. Louis, 7: 319.
1903 *Drepanium falciferum* Robt. ♀ ♂, Ent. News, 14: 105.

SPHECODES DAVISII Robt.

1897 *Sphecodes davisii* Robt. ♂, Trans. Ac. Sci. St. Louis, 7: 319.

SPHECODES DICHROUS Sm.

1853 *Sphecodes dichroa* Sm. ♀ (not ♂), Cat. Hym. Brit. Mus. 1. 38.
1865 *Sphecodes dichrous* Sichel, ♀, (not ♂), Ann. Soc. Ent. Fr. 5: 461.
1882 *Halictus scabrosus* Prov. ♂, Nat. Can. 13: 200.
1882 *Sphecodes dichroa* Prov. ♀, Nat. Can. 13: 257.
1883 *Halictus scabrosus* Prov. ♂, Faun. ent. Can. Hym. p. 700.
1883 *Sphecodes dichroa* Prov. ♀, Faun. ent. Can. Hym. p. 724.
1904 *Sphecodes dichrous* Ckll. Can. Ent. 36: 304.

SPHECODES EUSTICTUS Ckll.

1906 *Sphecodes eustictus* Ckll. ♀, Can. Ent. 38: 162.

SPHECODES FORTIOR Ckll.

1898 *Sphecodes fortior* Ckll. ♂, Bull. Denison Univ. 11: 44.

SPHECODES FRAGARIAE Ckll.

1903 *Sphecodes fragariae* Ckll. ♀, Trans. Am. Ent. Soc. 24: 98.

SPHECODES HERACLEI Robt.

1897 *Sphecodes heraclei* Robt. ♀, Trans. Ac. Sci. St. Louis, 7: 318.
1903 *Sphecodes heraclei* Robt. ♀ ♂, Ent. News, 14: 105–6.

SPHECODES HESPERELLUS Ckll.

1904 *Sphecodes hesperellus* Ckll. ♀ ♂, Can. Ent. 36: 232.

var. PULSATILLAE Ckll.

1906 *Sphecodes hesperellus* var. *pulsatillae* Ckll. Ann. Mag. Nat. Hist. ser. 7, 18: 75.

SPHECODES ILLINOIENSIS Robt.

1897 *Sphecodes pycnanthemi* Robt. (in part), ♀, Trans. Ac. Sci. St. Louis, 7: 320.
1903 *Machaeris illinoensis* Robt. ♀, Ent. News, 14: 107.

SPHECODES KINCAIDII Ckll.

1898 *Sphecodes kincaidii* Ckll. ♀, Proc. Ac. Nat. Sci. Phil. 1: 56.

SPHECODES KNETSCHI Ckll.

1898 *Sphecodes knetschi* Ckll. ♀ ♂, Trans. Am. Ent. Soc. 25: 186.

SPHECODES LEPTANTHI Ckll.

1904 *Proteraner leptanthi* Ckll. ♂, Ent. 37: 232.

SPHECODES MANDIBULARIS Cr.

1872 *Sphecodes mandibularis* Cr. ♀, Trans. Am. Ent. Soc. 4: 250.
1888 *Sphecodes mandibularis* Prov. ♀ ♂, Add. faun. Can. Hym. p. 335.
1897 *Sphecodes mandibularis* Robt. ♀ ♂, Trans. Ac. Sci. St. Louis, 7: 317.
1903 *Sphecodium cressonii* Robt. ♀ ♂, Ent. News, 14: 106.

SPHECODES MINOR Robt.

1898 *Sphecodes minor* Robt. ♀, Trans. Ac. Sci. St. Louis, 8: 45.

SPHECODES OLYMPICUS Ckll.

1904 *Sphecodes olympicus* Ckll. ♀, Can. Ent 36: 230.

SPHECODES PECOSENSIS Ckll.

1904 *Sphecodes pecosensis* Ckll. ♀, Ent. 37: 5.

SPHECODES PERLUSTRANS Ckll.

1898 *Sphecodes perlustrans* Ckll. ♀, Bull. Denison Univ. 11: 45.
1899 *Sphecodes perlustrans* Ckll. Can. Ent. 31: 256.

SPHECODES PIMPINELLAE Robt.

1900 *Sphecodes pimpinellae* Robt. ♀, Trans. Ac. Sci. St. Louis, 10: 51.
1903 *Sphecodium pimpinellae* Robt. ♀ ♂, Ent. News, 14: 106.

SPHECODES PYCNANTHEMI Robt.

1897 *Sphecodes pycnanthemi* Robt. ♀, (in part), Tr. Ac. Sci. St. Louis, 7: 320.
1903 *Sphecodium pycnanthemi* Robt. ♀, Ent. News, 14: 106.

SPHECODES RHOIS Ckll.

1904 *Proteraner rhois* Ckll. ♂, Ent. 37: 233.

SPHECODES SEMICOLORATUS Ckll.

1897 *Halictus semicoloratus* Ckll. ♀, Trans. Am. Ent. Soc. 24: 168.
1898 *Sphecodes semicoloratus* Ckll. Trans. Am. Ent. Soc. 25: 186.

SPHECODES SMILACINAE Robt.

1897 *Sphecodes smilacinae* Robt. ♀, Tr. Ac. Sci. St. Louis, 7: 317.

SPHECODES SOPHIAE Ckll.

1898 *Sphecodes sophiae* Ckll. ♀, Bull. Denison Univ., 11: 44.
1904 *Sphecodes sophiae* Ckll. Ent. 37: 232.

SPHECODES STYGIUS Robt.

1893 *Sphecodes stygius* Robt. ♀ ♂, Trans. Am. Ent. Soc. 20: 145.
1897 *Sphecodes stygius* Robt., Trans. Ac. Sci. St. Louis, 7: 317.
1903 *Machaeris stygia* Robt. ♀ ♂, Ent. News, 14: 107.

SPHECODES SULCATULUS Ckll.

1906 *Sphecodes sulcatulus* Ckll. ♀, Bull. Am. Mus. Nat. Hist. 22: 426.

SPHECODES RANUNCULI Robt.

1897 *Sphecodes ranunculi* Robt. ♀ ♂, Trans. Ac. Sci. St. Louis, 7: 318.
1903 *Proteraner ranunculi* Robt. ♀ ♂, Ent. 14: 105.

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Island of St. Vincent.

Sphecodes cupreus Ashm.

(99) *Sphecodes cupreus* Ashm. ♂, Trans. Ent. Soc. Lond. 2: 221.

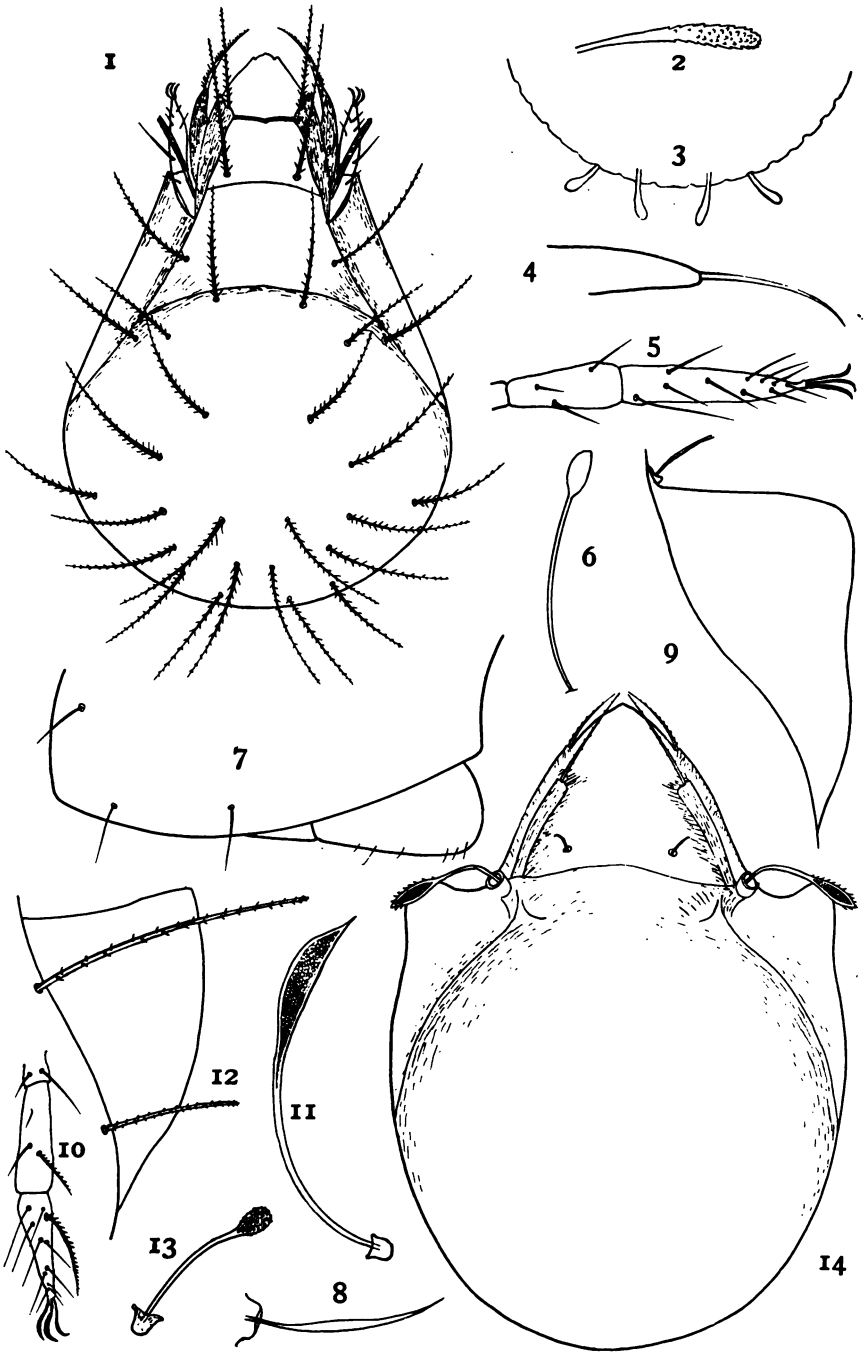
Sphecodes nitidiventris Ashm.

(99) *Sphecodes nitidiventris* Ashm. ♂, Trans. Ent. Soc. Lond. 2: 221.

Sphecodes thoracicus Ashm.

(99) *Sphecodes thoracicus* Ashm. ♀ ♂, Trans. Ent. Soc. Lond. 2: 222.

In "Synopsis of Sphecidae" (Ent. News, 14: 103) Mr. Charles Robertson has proposed to divide the local species of *Sphecodes* of Carlinville, Illinois, into the following genera: *Dialonia*, *Drepanium*, *Machaeris*, *Proteraner*, *Sphecodium*, and *Sphecodes* gens. str.



H. E. E. Del.

EWING : NEW ORIBATIDAE.

PSYCHE

NEW ORIBATIDAE.

BY H. E. EWING, URBANA, ILLINOIS.

THE present paper describes seven new species of Oribatidae, including a species of *Pelops*, the first of its genus to be described from this country. Type specimens have been deposited in the Illinois State Laboratory of Natural History.

Pelops americanus n. sp.

Figs. 2, 3, 4.

Dark brown; integument of medium thickness and covered with small pits.

The cephalothorax is about one-third as long as the abdomen. A long process, one-half as broad as long, extends from the anterior margin of the abdomen to beyond the tip of the rostrum. A pair of large, spatulate, serrate bristles is situated on the posterior dorsal part of the cephalothorax; they project almost to the tip of the rostrum and diverge from the median plane. Lamellae situated laterally; about one-half as long as the cephalothorax, curving toward the median plane and ending in a sharp point, from which extends a simple, curved, bristle almost as long as the lamella itself.

Abdomen about as broad as long. Two pairs of short spatulate bristles are situated on the posterior margin near the median plane. The inner and upper two incline slightly toward the median plane. The outer and lower two incline markedly away from the median plane. There are two pairs of similar dorsal bristles and a lateral pair of bristles situated about half way from the anterior to the posterior margin of the abdomen. Pteromorphae large, about four-fifths as long as the abdomen and extending forward to about the middle of the cephalothorax. Genital covers larger than the anal covers and situated about their length in front of the latter. Anal covers situated one and one-half times their length from the posterior margin of the abdomen and two-thirds their length from the posterior margin of the ventral plate.

Legs rather small; unguis tridactyle; tibia and tarsus of leg IV subequal.

Length, 0.60 mm.; breadth, 0.45 mm.

In moss. Collected by myself at Batavia, Ill. One specimen.

Oribata clavilanceolata n. sp.

Figs. 9, 10, 11.

Light brown; integument thin and brittle, slightly pitted around the margin of the abdomen.

Cephalothorax about one-half as long as the abdomen; lamellae long and narrow, three-fourths as long as the cephalothorax; no translamellae; a pair of small lateral lamellae extend two-thirds the distance to the tip of the rostrum, each lamella ending in a long curved bristle; pseudostigmatic organ with a long, recurved peduncle and an enlarged head, which tapers to a fine point; interlamellar hairs erect; palpi prominent.

Abdomen about two-thirds as broad as long; pteromorphae truncate, not extending beyond the anterior margin of the abdomen, but extending backward to about the middle of the abdomen. Abdomen hairless; anal covers large and situated about one-half their length from the posterior margin of the abdomen; genital covers about one-half as long as the anal covers, and situated about twice their length in front of the same.

Anterior pair of legs almost as long as the abdomen, the femur being the largest segment; tibia of leg I slightly longer than the tarsus. The legs bear a few, large, curved, dentate bristles. Unguis tridactyle.

Length, 0.70 mm.; breadth, 0.35 mm.

Under stones. Collected by myself at Batavia, Illinois. Many specimens.

Oribata clavipectinata n. sp.

Fig. 14.

Brown; integument of medium thickness, surface somewhat rough.

Cephalothorax about one-half as long as the abdomen; lamellae without cusps and two-thirds as long as the cephalothorax and of about the same width throughout their length; no translamellae; lamellar hairs slightly pectinate and as long as the lamellae themselves; interlamellar hairs two-thirds as long as the lamellar hairs and directed away from the median plane; lateral lamellae small, narrow, each bearing a long, curved bristle, as long as the lamellae themselves. The pseudostigmatic organ is about as long as the lamellae, is recurved and has a moderately long peduncle and a long, clavate, pectinate head.

The abdomen is about three-fifths as broad as long; the pteromorphae are attached to the anterior half of the lateral line; they are truncate in front and extend a little beyond the anterior margin of abdomen. The abdomen is hairless.

The legs are of moderate size, the femur being the largest segment. Unguis tridactyle.

Length, 0.60 mm.; breadth, 0.42 mm.

In moss. Collected by myself at River Forest, Illinois. A few specimens.

Oribata curva n. sp.

Figs. 5, 6.

Dark brown; integument thick and resistant.

Lamellae small and situated laterally; pseudostigmatic organ very long, almost twice as long as the tibia of leg I; recurved, with a long, narrow peduncle and a very large, subglobose head.

Cephalothorax with a pair of lateral hairs about half as long as the cephalothorax itself, curved, and extending slightly beyond the tip of the rostrum.

Abdomen subglobose with a few small hairs; pteromorphae very large, almost as long as the abdomen, extending nearly to the tip of the rostrum and rounded in front. Anal covers slightly larger than the genital covers and situated about their length behind the latter. Ovipositor large, its proximal segment about as long as leg I. The ovipositor when extended is as long as the mite; the three subequal distal forks are each about as long as the segment stalk from which they extend.

Legs rather small; tarsus of leg I longer than the tibia; tibia with an apical bristle about as long as the segment itself; femur of leg I subglobose. Unguis tridactyle.

Length, 0.40 mm.; breadth, 0.30 mm.

Under old logs. Collected by myself at Eola Junction, Illinois. A few specimens.

Oribata multipilosa n. sp.

Fig. 1.

Light brown; integument of moderate thickness; surface slightly rough.

Cephalothorax rather long; lamellae prominent, situated laterally, about one-half as long as the cephalothorax and ending each in a short cusp; translamella a mere line. A pair of lateral lamellae is present also, these being very narrow and bearing

each at its tip a long, curved, serrate bristle. Pseudostigmatic organs fusiform and almost as long as the lamellae. Lamellar hairs straight, pectinate and a little longer than the lamellae; inter-lamellar hairs similar to the lamellar hairs but longer.

Abdomen slightly longer than broad, bearing about two dozen large, conspicuous, dentate, bristles. Pteromorphae about as long as the cephalothorax but lying close to the body and projecting about one-half their length in front of the anterior margin of the abdomen. Genital covers smaller than the anal covers and situated about one and one-half times their length in front of the latter.

Legs small; unguis tridactyle.

Length, 0.75 mm.; breadth, 0.50 mm.

Under logs. Collected by myself at Eola Junction, Illinois. Several specimens.

Oribata serratoseta n. sp.

Figs. 12, 13.

Dark brown. Cephalothorax almost as broad as long; palpi prominent; lamellae narrow and about two-thirds as long as the cephalothorax; lamellar hairs straight, pectinate, and extending to the tip of the rostrum; interlamellar hairs about as long as the lamellar hairs; rostral hairs similar to the last, but curved. The pseudostigmatic organ has a small, recurved peduncle and a large, thick, subglobose head.

Abdomen two-thirds as broad as long, with many large, curved, serrate bristles. Pteromorphae short, triangular and two-thirds as broad as long, the anterior free margin being straight. Anal covers larger than the genital covers and situated one and one-half times their length behind the latter.

Legs large; tarsus and tibia of leg I subequal; tibia bearing a large bristle as long as the segment itself. Unguis tridactyle.

Length, 0.40 mm.; breadth, 0.30 mm.

In moss. Collected by myself at Eola Junction, Illinois. Three specimens.

Phthiracarus magnus n. sp.

Figs. 7, 8.

Dark brown; surface of integument smooth.

Cephalothorax about one-half as long as the abdomen. A pair of short curved bristles occurs close to the posterior margin of the cephalothorax and a similar pair

of bristles is situated near the anterior end of the cephalothorax; pseudostigmatic organ narrow, lanceolate, and about two-thirds as long as tarsus I.

The abdomen is rounded posteriorly and bears dorsally about six bristles, and ventrally two pairs of prominent bristles lateral to the anterior and posterior margins of the anus respectively. Genital covers prominent, each bearing about six small hairs.

Legs of medium length; tarsus about twice as long as the adjacent tibia; tarsus and tibia of first two pairs of legs each bearing a long bristle, almost as long as the cephalothorax. Unguis tridactyle.

Length, 1.30 mm.; height, 0.80 mm.

Under old logs. Collected by myself at Pine, Ind. Seven specimens.

Explanation of Plate.

Fig. 1. *Oribata multipilosa*, × 100.
Fig. 2. *Pelops americanus*, seta from the posterior dorsal part of cephalothorax, × 200.
Fig. 3. *Pelops americanus*, posterior margin of abdomen, × 110.
Fig. 4. *Pelops americanus*, lateral lamella, × 340.
Fig. 5. *Oribata curva*, tibia and tarsus of leg I, × 200.
Fig. 6. *Oribata curva*, pseudostigmatic organ, × 340.
Fig. 7. *Phthiracarus magnus*, ventral margin of abdomen, × 45.
Fig. 8. *Phthiracarus magnus*, pseudostigmatic organ, × 140.
Fig. 9. *Oribata clavilanceolata*, pteromorpha, × 200.
Fig. 10. *Oribata clavilanceolata*, leg II, × 108.
Fig. 11. *Oribata clavilanceolata*, pseudostigmatic organ, × 216.
Fig. 12. *Oribata serratoseta*, pteromorpha, × 260.
Fig. 13. *Oribata serratoseta*, pseudostigmatic organ, × 340.
Fig. 14. *Oribata clavipectinata*, × 134.

I would be glad to get material in the Noctuid genus *Homoptera* and its allies from all parts of the country for study in the preparation of a revision of this series. I will name and return specimens promptly, for the privilege of retaining such as may be needed in completing the work.

John B. Smith.

New Brunswick, New Jersey.

SOME EXPERIMENTS WITH HYBRIDS.

BY CAROLINE GRAY SOULE, BROOKLINE, MASS.

In 1906 I had many cocoons of larvae from *Cynthia* ♀ by *Promethea* ♂. In 1907 the moths emerged, and were hardly distinguishable from pure *cynthia*, though careful examination showed a duskier tint on the wings and a tendency toward the breaking into oblong patches of the inner marginal line on the hind wings. This however does not mean as much as the color difference, for some *cynthia* have the line more or less broken. The moths were as disappointing as the larvae had been, in following the *cynthia* marks so closely, and confirmed my belief that *cynthia* is prepotent in cross with any other species, though I have not been able to get moths from any other cross.

On May 30th, two pairs of the hybrid moths mated, the eggs hatched on June 19th, and the larvae lived through the third moult, dying, apparently from mere lack of vigor or "vitality."

On June 7th, two pairs mated, the eggs hatched on June 24th, and the larvae died in moulting for the third time.

On June 10th, two pairs were mated all night and until dark June 11th, but no eggs were laid. They remated on June 12th, no eggs being laid till June 15th. These hatched, the weather being very hot, on June 24th. The larvae died in moulting for the third time.

June 19th, one pair mated, but no eggs were laid.

The larvae were typical *cynthia* in looks, and very delicate. I had no ailanthus for them, but they ate wild cherry voraciously, preferring it to lilac or ash. Something was amiss with the cherry, in Tyson, Vt., this year, and I found several larvae of *promethea, polyphemus* and *excaecatus*, hanging from twigs limp and lifeless, just as my hybrids hung in my tins. Indeed I have never before found as many dead larvae as this year, and nearly all on wild cherry.

On May 19th, ♀ *polyphemus* mated with ♂ *promethea* for several hours, and laid many eggs which did not hatch.

May 22d, ♀ *promethea* mated with a ♂ hybrid (*cynthia* ♀ and *promethea* ♂) but laid no eggs.

May 23rd, ♀ hybrid mated with ♂ promethea, but laid no eggs.

May 27th, ♀ *cynthia* and ♂ cecropia mated, eggs were laid, and they remated on the 28th, more eggs were laid, but all were infertile.

May 27th, ♀ *R. jorulla* and ♂ *cecropia* mated; many eggs were laid but proved infertile.

May 28th, ♀ hybrid mated ♂ *promethea* but the many eggs were infertile.

May 30th, ♀ hybrid and *promethea*, no eggs.

" " ♀ *cecropia* and ♂ *jorulla*, many infertile eggs.

May 31st, ♀ hybrid mated ♂ *promethea* but the eggs failed to hatch.

June 3rd, another similar pair mated but no eggs were laid.

June 14th, ♀ *polyphemus* mated ♂ *promethea* and laid many eggs, infertile.

June 16th, ♀ *promethea* and small ♂ *cecropia* mated. Over 200 infertile eggs were laid, and the pair mated a second time. No eggs.

June 17th, another similar pair, with many infertile eggs.

June 17th, ♀ *promethea* mated ♂ hybrid, many eggs were laid; remated, and more eggs were laid, all infertile.

June 29th, ♀ *H. budleyi* and ♂ *cynthia* mated, a few infertile eggs were laid.

July 3rd, ♀ *cynthia* mated ♂ *budleyi*, many infertile eggs were laid.

June 19th, ♀ *jorulla* mated ♂ *promethea* and laid many infertile eggs.

June 20th, ♀ *jorulla* and ♂ *cecropia*. Many infertile eggs.

June 22d, ♀ *promethea* mated ♂ *jorulla* and laid infertile eggs.

June 23rd, ♀ *jorulla* mated ♂ *promethea* and laid many infertile eggs.

As in former experiments my results differ from Mr. Joutel's, in that my moths seem to mate more readily, and to oviposit, in most cases, more freely.

June 29th, ♀ *cynthia* mated ♂ *budleyi* and laid many eggs, two of which hatched on July 21st, but died before moulting.

July 3rd, ♀ *budleyi* and ♂ *cynthia* mated, a few infertile eggs.

July 9th, two pairs ♀ *cynthia* mated *promethea* ♂♂ attracted by a ♀ *promethea* near the window.

Fertile eggs resulted but the larvae died from the cherry.

July 18th, ♀ *promethea* mated ♂ *S. gordins*, apparently normally, and laid many infertile eggs.

From this experience I think that *cynthia* and *promethea* will mate any other species, and *cecropia* has mated with every species provided so far.

Polyphemus ♂♂ have been attracted to a dark window by ♀♀ of *cynthia*, *promethea*, and *cecropia* on several occasions, no ♀ of their own kind being in the room.

A REVIEW OF THE GENUS CHRYSOPHANUS.

BY KARL R. COOLIDGE, PALO ALTO, CALIFORNIA.

FOR some time the writer has been accumulating material in this genus with a view of monographing. Identifications of the various species of some genera of our *Rhopalocera* are often quite impossible, owing to the lack of necessary literature, so widely scattered. This is especially true in the west, where good entomological libraries are so rare. The writer believes that, if those who were working on any special genus or genera, would publish their results with the more important references, etc., our faunal knowledge would soon become much better known. In order to straighten out the present genus, the writer desires to obtain by purchase, exchange or loan, specimens of all our *Chrysophanids* from various localities. Immature stages, aberrations, minor variations, and specimens of *zeroe* and the *hypophleas* group, are especially desirable. The genus *Chrysophanus* is now divided into six genera, several more or less superficial, viz.: *Tharsalea, Gaeides, Chrysophanus, Epidemia, Heodes* and *Chalceria,* but for convenience in the following brief synopsis, the species are listed under the one genus.

1. *arota,* Boisd. This species is known, so far, only from California. It flies quite commonly in the vicinity of San Francisco Bay. It is closely allied to *virginiensis,* Edwards and may prove conspecific with it. Dyar has partially described the preparatory stages. The larva feeds on *Ribes.*

2. *virginiensis,* Edwards. Found at high altitudes in Colorado, Nevada and California. Common at Lake Tahoe. Nothing is known of the early stages.

3. *hermes,* Edw. *Hermes* is a rare species and is not very well known. It appears to be rather abundant at San Diego, California and is also reported from Nevada. Wright (Butterflies West Coast) redescribes it as *del-sud,* the specimens coming from the type locality.

4. *xanthoides,* Boisd. Another Californian species and the largest in North America. It was recently, however, discovered at Calgary, Canada. I have it from many localities in California and it is evidently widespread in its distribution there, occurring more commonly at fairly high altitudes. Boisduval, (Lep. de la Californie) writes "Montagnes de la Californie. Rare." Henry Edwards has described the egg.

5. *dione,* Scudder. Ranges from Iowa to Kansas, and is also found in Nebraska, Montana, Manitoba, and Colorado. It comes very close to *xanthoides*

and *editha*. The full-grown larva and pupa have been briefly described. The larva feeds on Rumex longifolius.

6. *editha*, Mead. Known from Oregon, California, Utah and Nevada. It is common at Lake Tahoe and is not rare in the vicinity of San Francisco Bay.

7. *gorgon*, Boisd. Occurs in Nevada and California. Mr. J. C. Grundel has briefly described the life history and he has kindly sent me a number of eggs. These are laid in the forks of a species of *Erigonum*. Usually but a single egg is deposited in a fork but sometimes as many as seven or eight are found, but are laid by different females. They are deposited in June or July and according to Mr. Grundel hatch the latter part of August, but those sent me have not hatched yet (October). The egg may be described as follows: Diameter about 1 mm.; color dirty creamy white. Hemispherical, flattened at base, marked by numerous prominent polygonal or semicircular depressions.

8. *thoe*, Boisd. A well known species, but the life history is still imperfect. It is found in the eastern states and I have specimens from New Mexico and Colorado.

9. *mariposa*, Reakirt. Recorded from Washington, Oregon, Montana, California, Colorado, British Columbia, and Canada. I have taken it commonly near Missoula, Montana. The larval food-plant is *Viccinium*.

10. *zeroe*, Boisd. An uncommon, though well distributed, species. I have it from Colorado, Montana and Lake Tahoe. It is also found in Utah, Wyoming and Idaho. The females are much rarer than the males. There is considerable variation in the tinting on the underside of the secondaries.

11. *helloides*, Boisduval. Common throughout the west from Iowa and Illinois to Vancouver Island. The larva feeds on *Polygonum aviculare*.

12. *dorcas*, Kirby. This is an arctic form found in Alaska, British America, South Labrador and has also been reported from Michigan. Wright considers it a northern variety of *helloides*. The variety florus, Edw., is known only from Garrett's Ranch, British America.

13. *epixanthe*, Bd.–Lec. Our smallest species, ranging from Newfoundland to Vancouver.

14. *hypophleas*, Boisd. Common in the Atlantic States. The aberration *fasciata*, Strecker, has the transverse rows of spots on primaries much enlarged, and blended together to form an irregular band. The variety *fulliolus*, Hulst, has the coppery reddish color replaced by a glowing somewhat sooty yellow. I am not acquainted with the var. *fieldeni*, McLach., which is recorded from Arctic America. The preparatory stages have yet to be fully worked out.

15. *phlaeas*, Bd.–Lec. A European species, which has been reported from Alberta.

16. *arethusa*, Dod. Described recently from Calgary, Canada. It is probably the western variety of *hypophleas*.

17. *cupreus*, Edw. Very rare, known only from Mt. Shasta and Oregon.

18. *snowi*, Edw. Occurs in Colorado, British America and Alberta, at high altitudes. In Colorado the food plant is *Oxyria digyna*.

19. *rubidus*, Edw. Flies in Utah, Nebraska, Oregon, Nevada and Montana. The var. *sirius*, Edw., is said to range from Montana to Arizona and to Ft. McCleod, British America. I have many specimens from Colorado.

A NEW LOCUSTID FROM NANTUCKET.

BY H. T. FERNALD, PH. D., AMHERST, MASS.

FIVE days of collecting on Nantucket Island from the fifth to the tenth of last September brought to light several interesting insects, among them being a nymph of *Dissosteira carolina* in which the front and rear margins of the pronotum are turned upward giving the plate much the appearance of a riding saddle. One day while collecting back of the town near the old cemetery I also noticed a green locustid, entirely brachypterous, which nevertheless had its well developed ovipositor so firmly wedged into a somewhat weathered board forming one rail of a fence that it required some force to extract it. On another day while collecting within a mile of this place a brachypterous male and a partly brachypterous female were captured and placed in my boxes.

Recently through the kindness of Prof. A. P. Morse of Wellesley I learn that though the partly winged specimen last named is an immature *Scudderia* the other two are *Leptophyes punctatissima* Bosc. which he states has never before been reported from this country though well known in Europe. There can be no doubt of the correct determination of these insects as Prof. Morse compared them with European specimens in the Scudder collection. The specimens are now in Prof. Morse's collection.

How this species reached Nantucket and how long it has occurred there can probably only be topics for speculation, but as little attention was paid to the Orthoptera in collecting it would seem probable that it is at least fairly common there.

GEOMETRID NOTES.— ON MESOLEUCA CAESIATA.

BY L. W. SWETT, MALDEN, MASS.

As I looked through the Packard collection at Cambridge, Mass., I noticed that his eastern types of *Mesoleuca caesiata* Denis & Schiffermüller were not like the European ones of his own or my collection. *Mesoleuca caesiata* in Packard's European collection numbered some 12 or 15 examples from Staudinger and others, the localities being Lapland, Iceland, Switzerland and Austrian Alps. His American examples were from Okak and Caribou Islands, also Mt. Washington, Aug. 1–11, and specimens from Randolph, Vt., in the Boston Society of Natural History. In the Proc. Bost. Soc. Nat. Hist., Vol. XI, 1866, page 51, he described *Cidaria aurata* from Okak, Caribou Islands and Mt. Washington, N. H. He speaks of these as having golden scales on the fore wings and on examining the types I found they agreed with the original descriptions but not with the European forms. Thus I saw we had two distinct species of which I note the following.

In *caesiata* European, the hind wings are whitish with traces of brown markings, the fringe of both wings being black and white. In some the markings are sharp and well defined, being powdered with golden scales. The discal spot is plain and distinct, there being a white and black cast to all wings. In *caesiata*, American form, or *aurata*, the specimens are of a brownish cast, smoky as it were and not black and white like the European. The hind wings lack the pallid white of true *caesiata* and are suffused with brown, and there are two white wavy zig-zag lines with brown margins to wings. The discal spot is suffused and the center of the mesial land is not clear, like European, but smoky and divided though not gray as some Iceland examples or reddish brown as my European examples from Pitcarpel. *Mesoleuca flavicincta* of Europe is a closely allied form to *aurata* but is so distinct as not to allow discussion. The variety *Mesoleuca inventaria* of Grote (Bull. Geol. Surv. Terr. Hayden VI, 591, 1882), may be a synonym of this but as I have not seen the type I can not say. While working over this matter last February, I wrote to Dr. Taylor in regard to the western forms, as they were unknown to me; and he assures me that they are the same as Eastern, though I believe he did not have the description as he did not then possess a copy of the description in the Boston Society Papers, for which he wrote afterwards. No doubt we shall have an interesting paper from him on the western form.

THE MALLOPHAGAN PARASITES OF THE KEA.

BY VERNON L. KELLOGG, STANFORD UNIVERSITY, CAL.

THE notorious sheep-destroying parrot of New Zealand, the Kea (*Nestor notablis* Gould), has not hitherto been examined to see what, if any, parasites help to make life troublesome for it as itself works misery for the New Zealand flocks. The Kea feeds on carrion mostly, but has also the deplorable habit of alighting on a sheep's back and tearing away the flesh until it gets at the kidney fat, which it eats with depraved relish. It then flies away, leaving its unfortunate victim to suffer until death mercifully comes to it.

Specimens of Mallophaga sent me by Mr. D. L. Van Dine, Entomologist of the U. S. Experiment Station at Honolulu, obtained by him from Mr. Brigham, Director of the Bishop Museum, show that Kea has some troubles of its own. In a vial of Mallophaga collected from the Kea in New Zealand there are three species of these parasites representing the genera *Lipeurus*, *Colpocephalum* and *Menopon*. All of these can be referred to already described species but curiously enough only one of them is a species typical of parrots, the other two being recorded only from true raptorial birds.

Lipeurus circumfasciatus Piaget, var. *kea* Kellogg. Males and females from the Kea, *Nestor notabilis* (New Zealand). Differs from the species type in the much larger size and the absence of even the slightest angular projection on 3rd segment of the male, and the presence of a distinct, although small, lateral projection on the 4th segment. Male, length, 2.30 mm., width .6 mm., female length 3 mm., width .61 mm.

Colpocephalum setosum Piaget. Several females from the Kea, *Nestor notabilis* (New Zealand). Differs markedly from any Colpocephalum so far described from parrots and is undoubtedly identical with Piaget's *C. setosum* described from the vulture, *Cathartes gryphus* (Zool. Garden of Rotterdam).

Menopon fulvofasciatum Piaget var. *kea* Kellogg. Three adult males and several young from a Kea, *Nestor notabilis* (New Zealand). Although differing in some details and a little larger than the type these specimens can probably be referred to Piagets' *M. fulvofasciatum* described from *Buteo vulgaris*. The Kea specimens are certainly unlike any Menopon previously recorded from the parrots. The differences which distinguish the Kea specimens from typical *fulvofasciatum* are the additional spines in lateral angles of prothorax, a difference in the ninth abdominal

segment which is *not* abruptly distinguished from the eighth as in the species type, the more strongly colored lateral ends of the transverse abdominal blotches, and the slightly larger size, the males being fully 2 mm., long, while *fulvofasciatum* is recorded as but 1.6 mm. in length (male).

THE HEMIPTERA OF JAMAICA.

NOTES ON JAMAICAN HEMIPTERA: A Report on a Collection of Hemiptera made on the Island of Jamaica in the spring of 1906. By E. P. Van Duzee (Bull. Buffalo Soc. Nat. Sci., VIII, No. 5, 1907). Our knowledge of the Hemiptera of Jamaica is greatly increased by this valuable paper, in which are recorded 236 with notes on distribution, etc. Of the above number 85 were new to science, the author describing about 54 species while the remainder belonging to the family Capsidæ were described by Dr. O. M. Reuter in the Of. Finsk Vet-Soc. Forhandl., XLIX, No. 5, 1907. The author is to be congratulated on doing such a splendid month's work under adverse climatic conditions. It clearly shows the value of specialization. The locality Rivington, N. J., on pages 24 and 69 should read 'Riverton.'

C. W. J.

The four-color process plate which appeared in the October number was made by the Sparrell Print of Boston. The Editors wish to make acknowledgment of their indebtedness to that establishment for friendly assistance in the design of the plate, and scrupulous care in its production.

ERRATA.— Readers of PSYCHE are requested to make corrections as following in the articles by Mr. A. A. Girault as printed in the current volume:

Hosts of Insect Parasites.

XIV, 1907, p. 30, 4th line from bottom, *Trissoleus* read *Trissolcus*.
p. 37, 15th line from bottom, *Townsend* read *Townend*.
last line, *Chales* read *Charles*.
p. 38, 8th line from bottom, *Drew* read *Dru*.
p. 39, 7th line *Catalogs* read *Catalogus*.

Colorado Potato Beetle.

p. 47, 3rd paragraph, *cruciform* read *eruciform*.
p. 52, line 4, *is* read *its*.

PSYCHE

INDEX TO VOLUME XIV. 1907.

AUTHORS.

Hancock, J. T., 45.
Carroll, A. N., 56.
Carroll, T. A., 17, 116.
Carlson, E. L., 114.
Cave, W. T., 4.
Cave, E. G., 62.
Emerton, J. H., 81.
Ewing, H. E., 111.
Fall, H. C., 29, 66.
Fernald, H. T., 129.
Ford, W. J. W., 47, 67.
Germain, A. A., 27, 42, 68, 125.
Gilmore, C. W., 1, 41, 72, 96, 113.
Gulick, T. L., 1, 126.
Kusa, F., 1.
Lovell, J. H., 17, 116.
Lovell, J., 45.
Mitchell, L. G., 11.
Morse, A. P., 14, 57.
Newcomb, H. H., 86.
Rosenfeld, A. H., 45.
Smith, E. J., 58.
Soule, C. G., 126.
Sweet, L. W., 126.
Thompson, M. T., 11.

NAMES IN INDEX.[1]

Acharaxypha gracilis, 1.
Acheta abbreviata pusilla, 27.
Acheta abbreviata, 72.
Acheta assimilis minor, 56.
  assimilis, 56.
Acheta gracilipes, 11.
Acheta, 4.
  variegata, 4.
Aegialia magnipennis, 74.
Aeletes aeglaeus, 82.
Aeletes, 14.
  gracilis, 14.
  major, 14.
Aeschna, 28.
Aeschna, 13, 15.
Aeschna clepsydra, 28.
Aeschna umbrosa, 27.
Aeschnidium, 1.
  graciliforme, 1.
Aeschnidium, 6, 7, 8.
  lata, 6.
  limata, 6.
  limbata, 6.
Aflexia cannulata, 116.
  punctulata, 116.
Agaricia hilaris, 64.
Agrotis, 56.
Agrotis annexa, 58.
Agrotis badinodis, 58.
Agrotis, 58.
  fraudulenta, 95, 96.
  infirmata, 95, 97.
  incerta, 95, 97.
  inermis, 95.
  major, 95, 96.
  mexicana, 95, 97.
  phthongicera, 95.
  pictilis, 95, 96.
  pygmaea, 95, 96.
  subvaria, 95, 96.
  validior, 95, 100.
  varia, 95, 99.

Calocordes confusaria, 92.
Cama, 28.
Calopteryx, 28.
Centroscia, 17.
Cephalocarantis, 55.
  gracilis, 56.
  rustica, 56.
  viridipennis, 55.
Chersocarantis, 55.
Chimera, 28.
Chimera anomalipes, 28.
Chirita eurycera, 59.
  brevicauda, 59.
  lata, 59.
  pallida, 59.
  palmata, 59.
  spinosa, 59.
Chlorida, 18.
Chlorophanus, 95.
  fraudulentus, 95, 96.
  infirmatus, 95, 97.
  incertus, 95, 97.
  major, 95, 96.
  mexicanus, 95, 97.
  phthongicerus, 95.
  pictilis, 95, 96.
  pygmaeus, 95, 96.
  subvarius, 95, 96.
  validior, 95, 100.
  varius, 95, 99.

Chlorocoma confusaria, 92.
Chlorocoma, 28.
Chlorocoma, 28.
Chlorocoma, 17.
Chlorocoma, 55.
  gracilis, 56.
  rustica, 56.
  viridipennis, 55.
Chlorocoma, 55.
Chlorocoma anomalipes, 41.
  aspera, 42.
  brevicauda, 42.
  lata, 42.
  vulga, 42, 64.
Chlorocoma gigas, 7.
  lineata, 7.
  nervosissima, 7.
Chlorophanus, 118.
  aeneicollis, 120.
  aeneus, 118.
  cupreus, 120.
  dione, 118.
  dromas, 116.
  dubiosus, 118.
  editus, 119.
  epixanthe, 119.
  gorgus, 119.
  helioides, 119.
  hermes, 118.
  hypophlaeas, 119.
    var. fasciatus, 89, 119.
    var. fulvidus, 119.
    var. fulvidens, 119.
  mariposa, 119.
  phlaeas, 119.
  rubidus, 120.
    var. sirius, 120.
  snowi, 120.
  thoe, 119.
  xanthoides, 118.
  zeroe, 119.

[1] Names of new Genera, Species and Varieties are in bold faced type.

Chrysotoxum arcuatum, 78.
derivatum, 78.
fasciolatum, 79.
laterale, 78.
pubescens, 78.
ventricosum, 77.
Cicindela purpurea.
var. audubonii, 64.
var. graminea, 64.
scutellaris, 64.
var. rugifrons, 64.
var. unicolor, 64.
Cidaria aurata, 121.
Citheronia sepulcralis, 63.
Coelioxys, 15, 20.
brevis, 20.
dubitata, 20.
rufitarsis, 20.
octodentata, 20.
sayi, 20.
Colias, 6, 7.
eurytheme, 6.
philodice, 89.
Colletes, 95.
Colpocephalum, 122.
setosum, 122.
Conservula anodonta, 63.
Culex, 1.
pipiens, 1, 4.
salinarius, 12.
vector, 12.
Culiseta consobrinus, 3.

Deinocerites, 11.
cancer, 11.
Dichaetoneura, 9.
leucoptera, 9.
Dinocarsis, 28.
Dissosteira carolina, 120.
Drassus saccatus, 40.

Elasmus albicoxa, 28.
Erigone fusca, 40.
Eunotus, 27.
Eupelmus, 28.
Euproctis chrysorrhea, 28.
Euptoieta, 8.
claudia, 63.
Eurosta bigloviae, 71.
reticulata, 71.
solidaginis, 71.
Euthyatira pudens, 63.
Eutreta diana, 71.
sparsa, 71.
Evania, 29.

Feltidia, 4.
Feralia jocosa, 63.
Forficula apicalis, 58.
bicolor, 58.

Glaresis, 23.
ecostata, 23.
frivaldskyi, 26.
inducta, 23, 24.
mendica, 23, 24.
phoenicis, 24.

Hadronotus, 28.
leptocorisae, 28.
Halictus, 15.
Heliothis obsoleta, 80.
Hemerobius, 28.
Hemileuca budleyi, 117.
maia, 64.
Heriades, 17.
carinatus, 17.
simplex, 18.
Hetaerius **minimus**, 68.
Homoptera, 115.
benesignata, 63.
Hylatoma, 28.
Hyperteles hylatomae, 28.

Idris, 28.

Janthinosoma, 4.
Junonia coenia, 28.

Laertias philenor, 63.
Lepisesia flavofasciata, 63.
Leptocorisa tipuloides, 28.
Leptinotarsa decemlineata, 46.
Leptophyes punctatissima, 120.
Lesticocampa lunata, 11, 13.
Limenitis, 89.
archippus, 64, 89.
arthemis, 90.
ursula, 90.
var. **albofasciata**, 90.
Lipeurus, 122.
circumfasciatus.
var. **kea**, 122.
Locusta oculata, 58.
Lycaena pseudargiolus.
var. arizonensis, 89.
tequa, 7.
xerxes, 7.

Macrorileya, 28.
Macroteleia, 28.
Malacosoma americana, 27.
disstria, 28.
Mantis cinerea, 58.
dilaticollis, 58.
maculipennis, 58.
Mechanitis californica, 7.
Megachile, 15, 18.
acuta, 18.
albula, 18.
brevis, 20.
circumcincta, 18.
decipiens, 19.
frigida, 18.
infragilis, 20.
latimanus, 18.
montivaga, 20.
relativa, 20.
vidua, 18.
Meganostoma eurydice, 5.
f. bernardino, 5.
Megathymus yuccae, 28.
Melanetaerius, 69.
infernalis, 69.
Melanoplus scudderi, 57.
Melitaea, 7.
phaeton, 89.
var. superba, 89.
Menopon, 122.
fulvofasciatum.
var. **kea**, 122.
Mesoleuca aurata, 121.
caesiata, 121.
flavicincta, 121.
inventaria 121.
Microstelis, 21.
Misumena aleatoria, 8.
Mixogaster breviventris, 80.

Nabis ferus, 28.
Neonympha, 8.
Neorileya, 28.

Oediaspis atra, 71.
polita, 71.
Okanagana, 21.
Oöencyrtus, 28.
Oribata **clavilanceolata**, 112.
clavipectinata, 112.
curva, 113.
multipilosa, 113.
serratosa, 114.
Osmia, 15.
albiventris, 17.

Osmia albolateralis, 16.
atriventris, 15.
bucephala, 17.
canadensis, 17.
frigida, 16.
globosa, 16.
inspergens, 17.
latitarsus, 17.
melanotricha, 16.

Pamphila melane, 7.
ocola, 63.
Paonias astylus, 63.
excaecatus, 28, 116.
Papilio polyxenes, 89.
troilus, 8.
turnus, 65.
Paratylotropidia **beutenmuelleri**, 14.
brunneri, 14.
Parnassius, 8.
Pelops, 111.
americanus, 111.
Phanurus, 28.
Phthiracarus **magnus**, 114.
Phyciodes tharos, 89.
var. packardii, 89.
Phytomyptera, 9, 21.
Pieris rapae, 6.
protodice, 6, 63.
Pimpla, 27.
Pipiza, 75.
albipilosa, 75.
artemis, 76.
australis, 77.
femoralis, 75.
festiva, 76.
Pipiza lunata, 76.
ornata, 76.
pulchella, 77.
quadrimaculata, 76.
radicum, 76.
Platygaster herrickii, 27.
Plusia balluca, 63.
Podagrion, 28.
Podisma **australis**, 57.
scudderi, 57.
Polynema, 28.
Polyneura, 28.
Prionus pocularis, 64.
Prosacantha, 28.
Psorophora, 11.
Pyrameis, 7.
cardui, 8.

Rothschildia jorulla, 117.

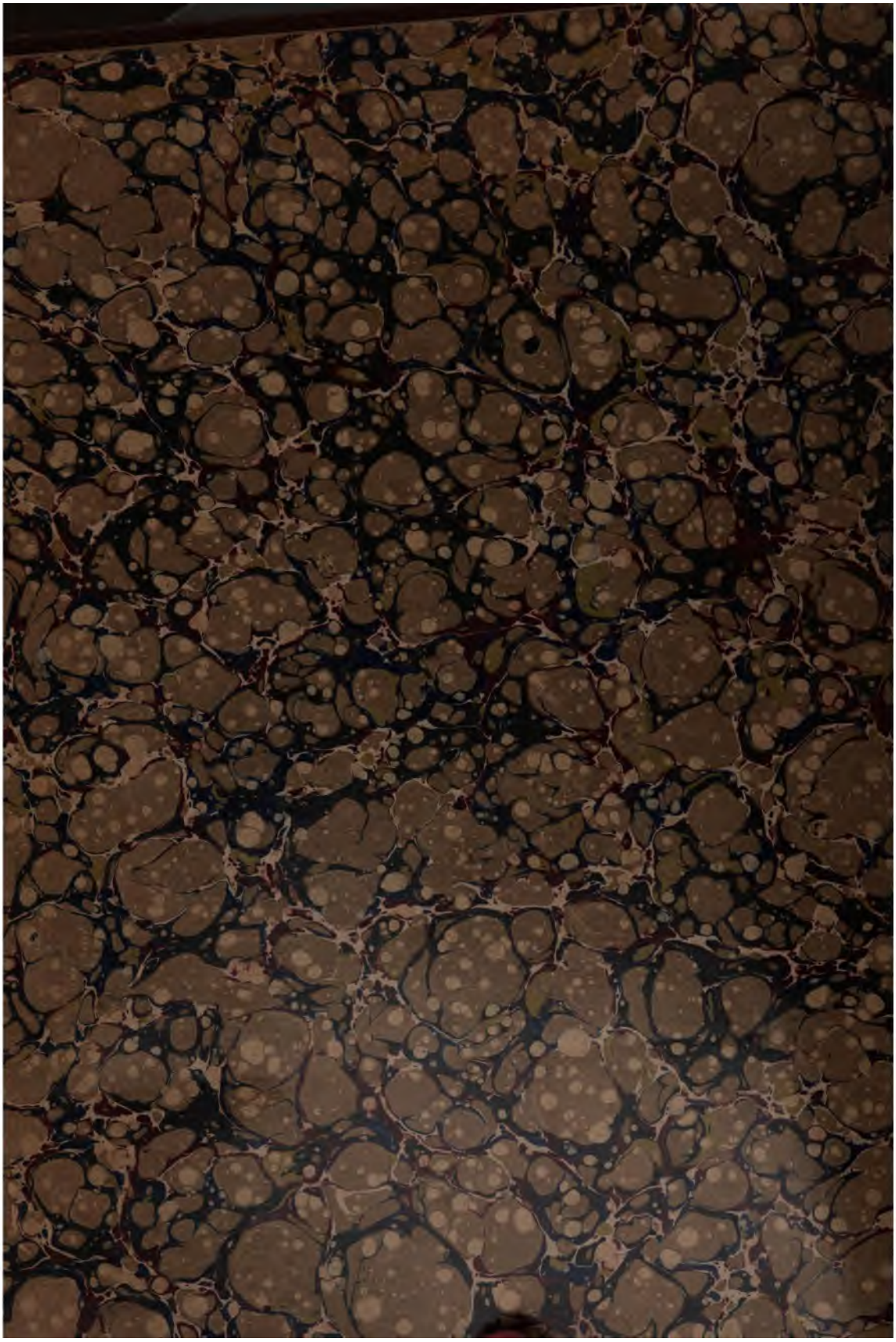
Samia cynthia, 116.
Sarcophaga, 27.
Satyrus wheeleri, 7.
Scelio, 28.
Schizura concinna, 10.
Scudderia, 120.
Serinetha trivittata, 28.
Sinea diadema, 57.
Sphecodes, 101.
dichrous, 101, 102.
galerus, 106.
lautus, 101, 103.
levis, 101, 105.
mandibularis, 101, 106.
nephelotus, 101, 106.
obscurans, 101, 103.
persimilis, 101, 103.
prosphorus, 101, 104.
Sphinx gordius, 117.
Stegomyia calopus, 3.
Stelis, 21.
foederalis, 21.
Stromatium pubescens, **64.**
Syrphus quadrimaculatus, **76.**

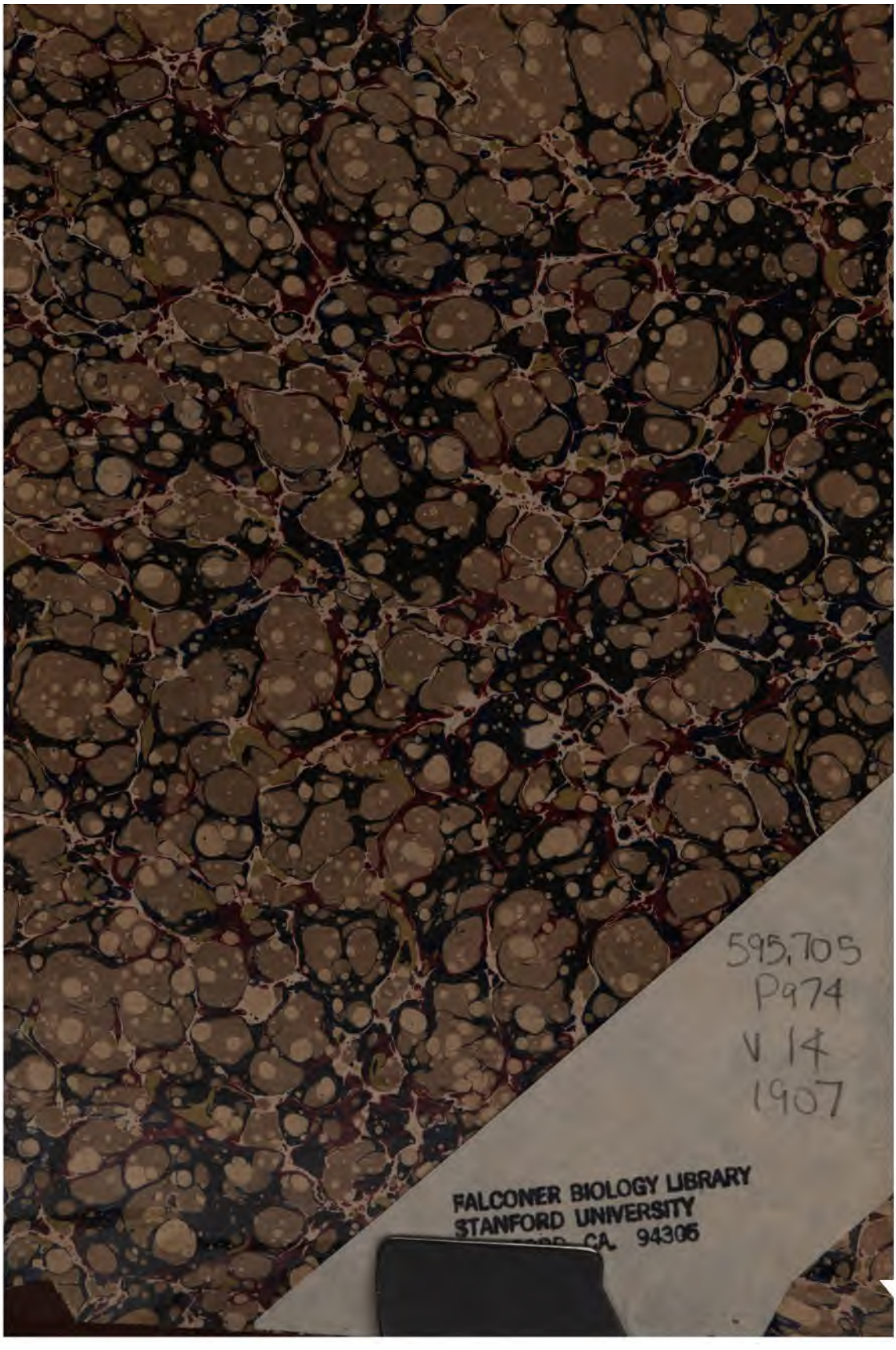
Telea polyphemus, 116.
Telenomus, 28, 29.
graptae, 29.
Terias lisa, 63.
Tettix scabrata, 58.
Thecla calanus, 65.
critola, 89.
dumetorum, 6.
edwardsii, 65.
iroides, 6.
Tibicen rimosa, 21.
septendecim, 21.
Thorybes pylades, 28.
Trichogramma, 28, 29.
pretiosa, 80.
Trissolcus, 28, 123.
Truxalis pharaonica, 58.
Trypeta baccharis, 71.
notata, 71.

Vanessa, 7.
antiopa, 21, 65.
cardui, 28.
milberti, 62.

Xanthosarus, 18.

Zeuzera pyrina, 63.




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